Tobacco Smoking among Health Care Workers

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I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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Signature Date

Statement on the Contribution of Others

All material in this thesis has now been published in peer-reviewed scientific journals by Derek R. Smith. The candidate for this award was the first author of all publications, as he was the project leader for each section. This thesis and the research contained within were supervised by Professor Peter A Leggat and as such, he is a co-author in many of the publications. Other coauthors from China are listed on the first page of each appropriate chapter.

Derek Richard Smith

April 2008

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Although written by one person, no research project is ever an entirely individual effort. As such, I would like to thank the following people and departments who helped make this research possible: Professor Peter A. Leggat (Head, School of Public Health and Tropical Medicine, James Cook University, Townsville, Australia), Dr Rui-Sheng Wang (International Center for Research Promotion and Informatics, National Institute of Occupational Safety and Health, Kawasaki, Japan), Professor Ning Wei (Hebei Medical University, Shijiazhuang, China) and Professor Yingze Zhang (Hebei Medical University, Shijiazhuang, China). As always, I extend continuing gratitude to my wife Dr Sarah Tang, and my parents Richard and Judy Smith, who have always encouraged me to pursue academic and scientific endeavors such as this.

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Abstract

Smoking represents a critical international priority for public health. According to the World Health Organization, tobacco is the second major cause of death and the fourth most common risk factor for disease, worldwide. If current trends continue it will be causing around 10 million deaths each year by 2020, with approximately 650 million fatalities overall. Smoking also represents a key issue for health care workers, as they play a lead role in the prevention of tobacco use in the community. Health care workers are on the frontlines of primary health care, and in this role they are widely viewed as exemplars by the community, their patients and their colleagues. As early as 1976, it was suggested that health care workers could best persuade patients to quit if they themselves did not smoke.

This thesis comprises five literature reviews and five research projects on the topic of tobacco smoking among health care workers. Research was conducted on groups of dentists, doctors, nurses, medical students and nursing students in Australia and China between 2004 and 2006. The review component targeted all published literature on the topic, from which a total of 289 English language manuscripts were examined. From an international perspective the prevalence of smoking among almost all health care workers appears to be declining in recent years, although in certain regions of Europe and Asia their smoking rate remains unacceptably high. Low rates of smoking among dentists and doctors were demonstrated in the United States, Australia and the United Kingdom.

Tobacco smoking research ascertained the prevalence, distribution, habits and correlates for smoking among various groups of health care workers in Australia and China. By profession, dentists were shown to have uniformly low smoking rates in the current study, while nurses by contrast had relatively high rates. In the research component, almost one-third of male Chinese doctors and one-half of male Chinese nurses were smokers. Only 6% of Chinese medical students and 4% of Queensland dentists smoked. Sixteen percent of Australian nursing students were smoking tobacco however, a habit which was correlated with age and year of study in the nursing course.

Overall, the research described within this thesis suggests that while tobacco smoking is probably declining among health care workers in recent years, the trend has not been uniform across these professions, nor has it occurred equally from country to country. Nurses and nursing students in particular, remain a subpopulation where tobacco smoking is fairly common. A greater commitment of public health efforts and tobacco control activities will need to target these groups in future.

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Abbreviations

ANOVA	-	Analysis of Variance
CI	-	Confidence Interval
HCW	-	Health Care Worker
JCU	-	James Cook University
OR	-	Odds Ratio
95%CI	-	95% Confidence Interval

Background

In 1954, Doll and Hill published a landmark paper which offered the first unequivocal evidence that smoking was bad for health. *"...resulting rates reveal that a significant and steadily rising mortality from deaths due to cancer of the lung as the amount of tobacco smoked increases"* (Doll & Hill, *British Medical Journal* 1954: 1455). Over fifty years later, despite the amassing of even stronger evidence to support the Doll & Hill's initial findings, many people are still smoking tobacco, including health care workers.

This thesis comprises an amalgam of five literature reviews and five research projects conducted between 2004 and 2006 while the author was associated with the School of Public Health and Tropical Medicine at James Cook University in Townsville, Australia. This association began as an MPH student, then an adjunct Senior Research Fellow, and since 2006, as an adjunct Senior Principal Research Fellow. All 10 parts of the thesis were derived from 10 manuscripts of the same name, which have now been published in peer-reviewed scientific journals. All parts of this thesis follow a central theme of tobacco smoking among health care workers. The literature reviews are divided into the following sections: Abstract, Introduction, Methods, Results and Discussion, Conclusion, References, and finally the Tables and Figures. The author of this thesis (Derek R. Smith) was the principal investigator and the first author on all 10 manuscripts submitted for publication. In four of the five of parts of Chapter 1, my supervisor from James Cook University, Professor Peter A. Leggat, is the co-author on the submitted manuscripts.

Chapter 1: Literature Review

Part 1:	Tobacco smoking among dentists	Published in 2006 [a]
Part 2:	Tobacco smoking among doctors	Published in 2007 [b]
Part 3:	Tobacco smoking among nurses	Published in 2007 [c]
Part 4:	Tobacco smoking among medical students	Published in 2007 [d]
Part 5:	Tobacco smoking among nursing students	Published in 2007 [e]

a) Smith DR, Leggat PA. A comparison of tobacco smoking among dentists in 15 countries. *International Dental Journal* 2006; 56 (5): 283-288.

b) Smith DR, Leggat PA. An international review of tobacco smoking in the medical profession: 1974-2004. *BMC Public Health* 2007 E-Pub June 20; 7 (1): 115.

c) Smith DR, Leggat PA. An international review of tobacco smoking research in the nursing profession, 1976-2006. *Journal of Research in Nursing* 2007; 12 (2): 165-181.

d) Smith DR, Leggat PA. An international review of tobacco smoking among medical students. *Journal of Postgraduate Medicine* 2007; 53 (1): 55-62.

e) Smith DR. A systematic review of tobacco smoking among nursing students. *Nurse Education in Practice* 2007; 7: 293-302.

Chapter 2: Research Articles

Part 1:	Tobacco smoking among dentists	Published in 2005 [a]
Part 2:	Tobacco smoking among doctors	Published in 2006 [b]
Part 3:	Tobacco smoking among nurses	Published in 2005 [c]
Part 4:	Tobacco smoking among medical students	Published in 2005 [d]
Part 5:	Tobacco smoking among nursing students	Published in 2007 [e]

a) Smith DR, Leggat PA. Tobacco smoking prevalence among a cross-section of dentists in Queensland, Australia. *Kurume Medical Journal* 2005; 52 (4): 147-151.

b) Smith DR, Wei N, Zhang YJ, Wang RS. Tobacco smoking habits among a cross-section of rural physicians in China. *Australian Journal of Rural Health* 2006; 14 (2): 66-71. [§]

c) Smith DR, Wei N, Wang RS. Contemporary smoking habits among nurses in Mainland China. *Contemporary Nurse* 2005; 20 (2): 258-266. [§]

d) Smith DR, Wei N, Wang RS. Tobacco smoking habits among Chinese medical students and their need for health promotion initiatives. *Health Promotion Journal of Australia* 2005; 16 (3): 233-235. [§]

e) Smith DR, Leggat PA. Tobacco smoking habits among a complete cross-section of Australian nursing students. *Nursing and Health Sciences* 2007; 9 (2): 82-89.

The research for Parts 2, 3 and 4 of Chapter 2 was conducted entirely in China, and as such, my Chinese collaborators are listed as the co-authors on three subsequent publications (refer to the above list with three manuscripts marked with this symbol [§]).

Despite the two sets of co-authors, all parts of this thesis follow a central theme of tobacco smoking among health care workers, and 7 out of 10 parts were conducted in association with James Cook University in Australia. The research articles are divided into the following sections: Abstract, Introduction, Methods, Results, Discussion, Conclusion, References, and finally the Tables and Figures. As each part represents a different project and was written to satisfy the requirements of different journals and different reviewers, some components in each part are longer or shorter than others. Similarly, the referencing system used for each part varied between the Harvard and Vancouver systems, depending on the requirements of the journal to which the manuscript had been submitted. The number of tables and figures for each article was also a function of each individual journal's requirements. Therefore, while all parts of the thesis contain at least one table, the overall number of tables and figures in each part is not uniform. Again, as with the references, this reflects the individual requirements of the journals to which each manuscript was submitted.

Location of the Studies

The Australian component of this research was conducted in a large university nursing school located in Townsville, Australia. Townsville is a regional city located around 2000 km north of Brisbane, the capital city of Queensland, and has a population of approximately 150 000. The dentists were located throughout Queensland, and were accessed by postal surveys in full cooperation with the Queensland branch of the Australian Dental Association. The Chinese component of this research was conducted among students within the Hebei Medical University Faculty of Medicine (the medical students), the Hebei Medical University School of Nursing (the nursing students) and the Third Teaching hospital of Hebei Medical University (the doctors and nurses). Hebei Medical University itself is located in Shijiazhuang, China, which is a city of approximately 1.5 million people situated 280 km south west of Beijing. All research projects were conducted between 2004 and 2006.

Ethical Approval

As the first half of this thesis (Chapter 1) consists entirely of literature review articles, ethical approval was not required. The research for Chapter 2 involved human subjects however, and as such, ethical considerations were necessary. All research involving human contacts was conducted in accordance with ethical protocols relevant for the countries in which it was conducted, and was supervised by appropriate personnel throughout. For the Australian component, ethical approval was obtained by the James Cook University Human Ethics Committee (document numbers: H1696 relates to the dentists and H1733 relates to the student nurses). As the smoking data from these subjects was

obtained during larger investigations of other health issues, the title of the ethics approvals does not specifically refer to smoking. Nevertheless, approval was given to use the questionnaires which contained our tobacco smoking questions, the data from which appears in this thesis. Please refer to the Appendix for copies of JCU ethical approval documents H1696 and H1733. All three articles from the Chinese component (Chapter 2, Parts 2, 3 and 4) relate to previously published work and comprise my application for 'Credit for Advanced Standing'. As such, copies of ethical approval notices from Chinese institutes are not required to be attached to this thesis

Chapter 1

Literature Review

Part 1

Tobacco Smoking among Dentists

Published as:

Smith DR, Leggat PA. A comparison of tobacco smoking among dentists in 15 countries. *International Dental Journal* 2006; 56 (5): 283-288.

A Comparison of Tobacco Smoking among Dentists in 15 Countries

ABSTRACT

This study was conducted as a systematic review of all modern literature describing the prevalence and associations of tobacco smoking among dentists. A keyword search of appropriate MeSH terms was initially undertaken to identify relevant material. Reference lists of manuscripts were also examined to locate further publications. A total of 35 English-language studies published in the past 25 years met the inclusion criteria. Results suggest that the prevalence of smoking is generally quite low among dentists, and that it is also declining in many countries during recent years. The lowest rates were documented in the United States (US), Thailand, Finland, Australia and Canada. When multiple studies were examined over time, it appears that dentists in Australia and the US consistently report the lowest prevalence. Overall, this review suggests that dentists have one of the lowest smoking rates among all health professionals. There were a few exceptions however, namely Italy and Jordan, where dentists appear to be smoking at high rates. Nevertheless, it is important that tobacco usage continues its decline in future years so that the dental profession may remain exemplars at the forefront of preventive oral care.

Introduction

Smoking represents a critical international issue for public health. Smoking already kills around two million people every year in developed countries, and if current trends continue, around 200 million tobacco-related deaths can also be expected in developing regions.[1] Smoking also represents a key issue in the dental profession for a number of reasons. Firstly, dentists are on the frontlines of primary care,[2] and the dental office itself affords significant opportunity to provide tobacco-cessation advice to patients.[3] Previous studies have shown that almost two-thirds of all dental appointments may be for diagnostic or preventive services[4], and more than half of all adult smokers visit a dentist each year.[5] Dental patients may be particularly receptive to health messages during this time, while visible evidence of the damage tobacco exerts on the oral cavity may further encourage users to quit.[6]

Secondly, health professionals are widely viewed as exemplars by the community, their patients and their colleagues. In recent years, the dental profession has become increasingly aware of the physiological mechanisms and subsequent damaging effect that tobacco usage has on the oral cavity.[7] Such diseases range in severity from minor to malignant, including dental calculus, halitosis, acute necrotizing ulcerative gingivitis, delayed wound healing and oral cancer.[7] Fortunately, dentists have many opportunities to reduce the community prevalence of smoking.[3] Although helping their patients to quit is clearly an important part of primary oral care, relationships may exist between a health professional's own tobacco usage and their subsequent desire to help

patients quit. As early as 1976, Garfinkel[8] suggested that health professionals can best persuade patients to quit smoking 'if they themselves do not smoke'.

Aside from its impact on patients' health, tobacco usage also represents an important occupational health issue for dentists. To this end, the International Labour Office (ILO) has suggested that the promotion of smoke-free environments forms a key part of any healthy and safe workplace.[9] Although tobacco smoking remains a significant cause of many oral diseases that dentists will encounter during their practice, dentists have not always set a positive example for patients in this regard. Some of the earliest epidemiological research conducted among dentists revealed that around 40% of them were smokers in 1959,[8] a figure which had fallen to 23% by 1975.[10] Subsequent large surveys from the United States (US) suggest that tobacco use continued to decline on a national basis, with only 14% of dentists smoking cigarettes and 8% smoking pipes or cigars by the 1980s.[11] There is some evidence to suggest that dentists respond to health education.[12] The American Cancer Society enrolled a prospective study in 1982 which revealed a smoking prevalence rate of around 23% among dentists.[13] A subsequent US National Health Interview Survey predicted a national smoking rate of around 7% among dentists between 1987 and 1994.[14,15]

Although these investigations suggest tobacco use among dentists is probably declining in the US, international trends do not appear to have been clearly elucidated. Furthermore, few if any, researchers have reviewed tobacco-smoking habits in the dental profession from an international perspective. The

aim of this study therefore, was to undertake a comprehensive review of international tobacco smoking surveys which have been conducted among dentists in recent years, with particular attention to prevalence rates.

Methods

This systematic review targeted all modern literature published in peer-reviewed journals, which related to the topic of tobacco smoking among dentists. As the nature of research changes over time and results quickly date, it was considered necessary to include only manuscripts published in the previous 25 years. For consistency, only English-language manuscripts were included and the search criteria were limited to articles published from 1980 onwards. The literature review began with a Medline search of relevant Medical Subject Headings (MeSH) 'smoking', 'tobacco' and 'dentist.' After identifying some initial studies, the search was repeated using keyword variations such as 'smoke' and 'dental.' Reference lists of manuscripts initially located using the above-mentioned criteria were then examined for additional publications, which could not be found using search engines. To standardise results throughout, smoking rates were listed as the prevalence of smoking among the entire group (males and females combined), all percentages of which were rounded to the nearest whole number. Response rates for each study were also rounded to the nearest whole number for standardisation purposes.

Results and Discussion

A total of 35 published studies met the inclusion criteria.16-46 Refer to Table 1. The overwhelming majority (n=31, 89%) had been conducted as postal

surveys,[16-20,22-27,29-36,38-44,46] two were telephone surveys,[21,28] one was conducted at a conference[45] and one used both postal surveys and follow-up telephone interviews.[37] Almost half the studies (n=14, 40%) had been published since the year 2000,[16-25] 16 had been undertaken between 1990 and 2000,[26-41] with the remaining investigations conducted prior to 1990.[42-45] One study which fell just outside the 25 year limit was also included,[46] as it was one of the first investigations to provide detailed information on dentists' smoking habits in Australia. Overall, ten manuscripts in this review originated from the United States, nine from Europe, seven from the United Kingdom, five from Australia and the remaining four from other areas. Most authors targeted dentists within a single county, although Allard[25] surveyed dentists from a number of regions as part of the EU Working Group on Tobacco and Oral Health.

Unfortunately, no studies of tobacco smoking habits among Asian dentists met our inclusion criteria. Although a Japanese investigation found the 1997 prevalence of smoking to be 28% among male and 2% among female dentists,[47] their manuscript was published in Japanese and was thus unable to be included in our review. Sample sizes of the surveys which were included varied greatly however, ranging from 3330 to 2628.[33] Response rates also ranged from 8%45 to 90%.[33] One Australian study appeared to have a 100% response rate,[37] although according to the authors, initial non-respondents to the survey were replaced until a sufficient number of participants could be obtained. This may have affected validity. In Sweden on the other hand, Halling et al[33] surveyed over 2500 dentists and obtained a 90% response rate. Laskin[43]

also sampled over 1000 participants during his 1987 investigation, although a low response rate was achieved (28%).

When investigated from an international perspective, the overall prevalence of smoking appears to be quite low among dentists. There were some notable exceptions, however, namely Jordan[20] and Italy,[28] where around one-third of dentists were current tobacco users. In Jordan, one-fifth of dentists also said they smoked 20 or more cigarettes per day.[20] Despite this finding, the international smoking prevalence rate appears to be steadily declining among dentists in recent years, with nine studies conducted since the year 2000 reporting prevalence rates below 10%. The lowest rate was documented in the United States (1%),[36] with similar low rates also being demonstrated in Thailand (2%),[23] Finland (3%),[25] Australia (3%)[26] and Canada (4%).[35] When multiple studies were examined over a period of time, it appears that contemporary dentists in Australia and the United States consistently report the lowest smoking rates (between 3% to 6% and 1% to 9%, respectively).

This was not always the case however, with earlier research from the United States and Australia suggesting that dentists' smoking rates 20 to 25 years ago were considerably higher than they are now (18% in 1984[44] and 23% in 1979,[46] respectively). Regarding contemporary smoking habits, slightly higher rates were demonstrated in European countries such as Sweden (10%[25] to 13%[33]), the Netherlands (12%[25] to 16%[24]) and Denmark (12%[25]). A similar rate was reported among New Zealand dentists in 1995 (11%).[32] McCartan et al[38] documented a slightly higher smoking prevalence among Irish dentists (15%),

although the response rate of their study was low (43%). More disturbingly, 22% of their smokers declared no intention of quitting.

Aside from overall prevalence rates, additional information was also obtained with regard to tobacco smoking habits in the dental profession. Some studies for example, reported the prevalence of ex-smokers, as well as those dentists who had never smoked. In this regard, the prevalence of former smokers appears to range from 11%[16] to 48%,[43] with many between 20% and 45%.[22,25,26,28,29,35,38,40] The proportion of never smokers was similarly encouraging, with rates between 55%[42] and 82%.[18] An important observation was the large number of studies where male dentists smoked at higher rates than females.[19,20,24,33,41,46] This finding was not without exception however. In Thailand[23] for example there were no female smokers at all, which may suggest a cultural reluctance for professional women to smoke in Asia. In Ireland on the other hand, the prevalence rate among male and female dentists was exactly the same (15% each).[38]

A large proportion of studies did not divide their smoking prevalence rates by sex, making it impossible to do further gender comparisons. Age was another interesting correlate regarding tobacco use, with higher prevalence rates seen among older dentists in some studies.[16,28,43] Length of time already spent in the dental profession was an additional correlate demonstrated by some authors,[16,42] although again, this probably reflects older age more than anything else. Aside from the aforementioned Jordan study,[20] only two other investigations appear to have clearly described the degree of smoking, both of

which found the majority of smokers to be fairly light.[27,44] Similarly, many investigators did not specifically ask the type of tobacco consumed by the dentist. Although cigarette usage was common,[17,19,27,34,39] the use of pipes and cigars,[20,32,41,45,46] snuff[33,43] or water pipes[20] was also reported in some studies. When compared to other members of the dental profession, our current review suggests that dentists probably smoke at lower rates than dental hygienists.[18,34] When compared to physicians who were also surveyed at the same time however, some research indicated that dentists may smoke at higher rates,[17,30] while others found their rate to be lower.[36] It is difficult to say therefore whether physicians smoke at lower rates than dentists, or vice versa, although the overall prevalence of both groups is encouragingly low. A relatively higher rate of tobacco usage among dental hygienists when compared to dentists was noted in some studies, with their prevalence rates reported to be between 3% in the US[34] and 17% in Sweden.[33] Nevertheless, due to the small number of researchers who actually investigated dental hygienists and dentists simultaneously, it is difficult to surmise whether this represents a genuine trend.

A relatively large number of important publications were located during this review. One confounding factor across many investigations however, was a lack of standardisation regarding the definition of 'current smoker'. Although most referred to their subjects as being either smokers or non-smokers, others used smoking recall periods ranging from one week to one month in their definition of the term 'current'. This may have arisen due to the inherent difficulties of assessing smoking habits over time, and the fact that most investigations simply described a point-prevalence of smoking within the surveyed group. Despite

certain variations in research quality, a large proportion of all investigations had reasonable sample sizes in the hundreds, and admirable response rates of between 70% and 80%. This allows a reasonably high degree of confidence in the data presented.

The overall low rate of tobacco usage revealed during this study suggests that dentists smoke at one of the lowest rates among all health professionals, and much lower than that of the communities in which they live. There were some notable exceptions however, namely Jordan[20] and Italy,[28] where around one-third of the dentists surveyed were current smokers. This is even higher than the reported community prevalence of smoking in these two countries. According to the World Health Organization[48] around 25% of Italian and 29% of Jordanian adults are current smokers. Community smoking rates have marked variations in gender however, with 32% of Italian and 48% of Jordanian men being current smokers.[48] The high prevalence noted among dentists may therefore reflect a higher proportion of male dentists in these particular countries. The identification of age and its relationship with dentists' smoking habits was also an interesting observation. A greater awareness, or even an entrenched awareness, of the negative health effects related to smoking among younger dentists is a possible explanation for such behaviour.

This relates not only to smoking initiation among younger dental practitioners, but also the decision to quit smoking among their older peers, who may be more nicotine dependent and therefore, less likely to give up. Smoking rates probably decrease over time due to a generational effect, as the social climate

of a country changes and more people give up smoking, dentists included. As a pseudo-marker of age (particularly where age of the participants was not directly stated), year of graduation was also shown to affect smoking rates during some investigations.[22,29,35,37,45] Similar to the first, this second phenomenon probably relates to age more than anything else, and may have arisen simply because the dentist's age was not directly measured in some studies.

Why so few dentists appear to be smoking is unclear, although it probably relates to their graphic awareness of the negative side-effects that tobacco consumption may incur for the oral cavity. There are also certain demographic and professional similarities between dentists and physicians, with physicians in most societies tending to give up smoking before the general population.[49] Physicians may recognise the negative medical consequences more quickly than the general public, their devotion to health naturally conflicts with unhealthy behaviours, and finally, tobacco smoking usually incurs a negative image in health care long before it does so in the wider community.[49] Given their undoubted similarities with physicians, it is reasonable to assume that dentists may also be influenced in a similar manner.

Although dental professionals have many opportunities to reduce the prevalence of smoking,[3] dentistry may have not yet maximized its efforts in meeting the tobacco epidemic.[5,6] Dentists may not routinely incorporate tobacco cessation into their practice.[3] Dentists clearly need to be involved in the prevention and management of oral diseases, while striving actively to manage

the overall health of patients.[2] Dentists also need to expand the bounds of dental practice and embrace smoking-cessation activities as part of comprehensive oral care for patients. Indeed, Glick[50] suggested that such professional behaviour should no longer be a choice. The fact that any of them continue to smoke is surprising, as dentistry has become increasingly aware of the damaging effect tobacco consumption has on the oral cavity,[7] as well as many other aspects of general health. Dentists incur a certain responsibility as exemplars for patients with regard to healthy behaviour, while a dentist who is himself or herself a smoker may be less likely to counsel a smoking patient. In Norway for example, Lund et al[18] showed that non-smoking dentists reported higher tobacco-cessation intervention levels than their smoking colleagues. Numerous barriers that may impede tobacco-cessation activities in the dental office have already been postulated[3] and it is important therefore that the prevalence of smoking among dentists continues to decline in future years.

Conclusion

Overall, this study suggests that dentists in many countries have one of the lowest smoking rates among all health professionals and a generally lower rate than the communities in which they live. There were a few exceptions however, namely Italy and Jordan, where dental professionals appear to be smoking at high rates. The fact that dentists smoke at all is surprising, and implies that further preventive efforts will need to be focussed on dentists themselves. It is important therefore that the prevalence of smoking in the dental profession maintains its decline in future years, so that dentists can continue to set a good

example whilst remaining at the forefront of anti-smoking programs in the community.

References

1. Peto R. Smoking and death: The past 40 years and the next 40. *BMJ* 1994; 309: 937-939.

2. Kunzel C, Lalla E, Albert DA, Yin, H, Lamster IB. On the primary care frontlines: The role of the general practitioner in smoking-cessation activities and diabetes management. *J Am Dent Assoc* 2005; 136: 1144-1153.

3. Albert DA, Severson H, Gordon J, Ward A, Andrews J, Sadowsky D. Tobacco attitudes, practices, and behaviors: A survey of dentists participating in managed care. *Nicotine Tob Res* 2005; 7 Suppl 1: S9-S18.

4. Manski RJ, Moeller JF. Use of dental services: An analysis of visits, procedures and providers, 1996. *J Am Dent Assoc* 2002; 133: 167-175.

5. Tomar SL, Husten CG, Manley MW. Do dentists and physicians advise tobacco users to quit? *J Am Dent Assoc* 1996; 127: 259-265.

6. Tomar SL. Dentistry's role in tobacco control. *J Am Dent Assoc* 2001; 132 Suppl: 30S-35S.

7. Christen AG. Tobacco cessation, the dental profession, and the role of dental education. *J Dent Educ* 2001; 65: 368-374.

8. Garfinkel L. Cigarette smoking among physicians and other health professionals, 1959-1972. *CA Cancer J Clin* 1976; 26: 373-375.

9. Håkansta C. Workplace Smoking. Working Paper: A review of national and local practical and regulatory measures. pp 1-89, Geneva: *International Labor Office* (ILO), 2004.

10. Centers for Disease Control and Prevention (CDC). Smoking behavior and attitudes of physicians, dentists, nurses, and pharmacists, 1975. *MMWR Morb Mortal Wkly Rep* 1977; 26: 185.

11. Garfinkel L, Stellman SD. Cigarette smoking among physicians, dentists, and nurses. *CA Cancer J Clin* 1986; 36: 2-8.

12. Scully C, Cawson RA, Griffiths M. Mortality and some aspects of morbidity (Ch. 1). In: Occupational Hazards to Dental Staff pp 1-21, London: *British Dental Association*, 1990.

13. Stellman SD, Boffetta P, Garfinkel L. Smoking habits of 800 000 American men and women in relation to their occupations. *Am J Ind Med* 1988; 13: 43-58.

14. Nelson DE, Emont SL, Brackbill RM, Cameron LL, Peddicord J, Fiore MC. Cigarette smoking prevalence by occupation in the United States. A comparison between 1978 to 1980 and 1987 to 1990. *J Occup Med* 1994; 36: 516-525.

15. Lee DJ, LeBlanc W, Fleming LE, Gomez-Marin O, Pitman T. Trends in US smoking rates in occupational groups: The National Health Interview Survey 1987-1994. *J Occup Environ Med* 2004; 46: 538-548.

16. Smith DR, Leggat PA. Tobacco smoking prevalence among a cross-section of dentists in Queensland, Australia. *Kurume Med J* 2005; 52: 147-151.

17. Kenna GA, Wood MD. The prevalence of alcohol, cigarette and illicit drug use and problems among dentists. *J Am Dent Assoc* 2005; 136: 1023-1032.

18. Lund M, Lund KE, Rise J. Preventing tobacco use in Norwegian dental practice. *Community Dent Oral Epidemiol* 2004; 32: 385-394.

19. Underwood B, Fox K, Nixon PJ. Alcohol and drug use among vocational dental practitioners. *Br Dent J* 2003; 195: 265-268.

20. Burgan SZ. Smoking behavior and views of Jordanian dentists: A pilot survey. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; 95: 163-168.

21. Trotter L, Worcester P. Training for dentists in smoking cessation intervention. Aust Dent J 2003; 48: 183-189.

22. John JH, Thomas D, Richards D. Smoking cessation interventions in the Oxford region: Changes in dentists' attitudes and reported practices 1996-2001. *Br Dent J* 2003; 195: 270-275.

23. Leggat PA, Chowanadisai S, Kedjarune U, Kukiattrakoon B, Yapong B. Health of dentists in southern Thailand. *Int Dent J* 2001; 51: 348-352.

24. Gorter RC, Eijkman MA, Hoogstraten J. Burnout and health among Dutch dentists. *Eur J Oral Sci* 2000; 108: 261-267.

25. Allard RHB. Tobacco and oral health: Attitudes and opinions of European dentists; A report of the EU working group on tobacco and oral health. *Int Dent J* 2000; 50: 99-102.

26. Clover K, Hazell T, Stanbridge V, Sanson-Fisher R. Dentists' attitudes and practice regarding smoking. *Aust Dent J* 1999; 44: 46-50.

27. Kay EJ, Scarrott DM. A survey of dental professionals' health and well-being. *Br Dent J* 1997; 183: 340-345.

28. Lodi G, Bez C, Rimondini L, Zuppiroli A, Sardella A, Carrassi A. Attitude towards smoking and oral cancer prevention among northern Italian dentists. *Oral Oncol* 1997; 33: 100-104.

29. John JH, Yudkin P, Murphy M, Ziebland S, Fowler GH. Smoking cessation interventions for dental patients - Attitudes and reported practices of dentists in the Oxford region. *Br Dent J* 1997; 183: 359-364.

30. Hill HA, Braithwaite RL. Attitudes, beliefs, and practices regarding smoking and smoking cessation among African-American physicians and dentists. *J Natl Med Assoc* 1997; 89: 745-751.

31. Chestnutt IG, Binnie VI. Smoking cessation counselling - A role for the dental profession? *Br Dent J* 1995; 179: 411-415.

32. Skegg JA, McGee RO, Stewart AW. Smoking prevention: Attitudes and activities of New Zealand dentists. *NZ Dent J* 1995; 91: 4-7.

33. Halling A, Uhrbom E, Bjerner B, Solen G. Tobacco habits, attitudes and participating behavior in tobacco prevention among dental personnel in Sweden. *Community Dent Oral Epidemiol* 1995; 23: 254-255.

34. Hastreiter RJ, Bakdash B, Roesch MH, Walseth J. Use of tobacco prevention and cessation strategies and techniques in the dental office. *J Am Dent Assoc* 1994; 125: 1475-1484.

35. Campbell HS, Macdonald JM. Tobacco counselling among Alberta dentists. *J Can Dent Assoc* 1994; 60: 218-220, 223-226.

36. Brink SG, Gottlieb NH, McLeroy KR, Wisotzky M, Burdine JN. A community view of smoking cessation counselling in the practices of physicians and dentists. *Public Health* Rep 1994; 109: 135-142.

37. Mullins R. Attitudes and smoking habits of dentists in Victoria: 16 years on. *Aust Dent J* 1994; 39: 324-326.

38. McCartan BE, Sadlier D, O'Mullane DM. Smoking habits and attitudes of Irish dentists and dental students. *J Ir Dent Assoc* 1993; 39: 26-29.

39. Logan H, Levy S, Ferguson K, Pomrehn P, Muldoon J. Tobacco-related attitudes and counseling practices of Iowa dentists. *Clin Prev Dent* 1992; 14: 19-22.

40. Fried JL, Cohen LA. Maryland dentists' attitudes regarding tobacco issues. *Clin Prev Dent* 1992; 14: 10-16.

41. Telivuo M, Vehkalahti M, Lahtinen A, Murtomaa H. Finnish dentists as tobacco counselors. *Community Dent Oral Epidemiol* 1991; 19: 221-224.

42. Secker-Walker RH, Solomon LJ, Hill HC. A statewide survey of dentists' smoking cessation advice. *J Am Dent Assoc* 1989; 118: 37-40.

43. Laskin DM. Smoking habits and attitudes of oral and maxillofacial surgeons. *J Oral Maxillofac Surg* 1987; 45: 493-495.

44. O'Shea RM, Corah NL. The dentist's role in cessation of cigarette smoking. *Public Health Rep* 1984; 99: 510-514.

45. Christen AG. Survey of smoking behavior and attitudes of 630 American dentists: Current trends. *J Am Dent Assoc* 1984; 109: 271-272.

46. Dodds AM, Gray NJ, Hill DJ, Rankin DW. Attitudes and smoking habits of dentists in Victoria. *Aust Dent J* 1979; 24: 143-145.

47. Kishimoto M, Hanioka T, Tanaka M, Shizukuishi S. Lifestyle and health practices of dentists in an alumni association of a dental school in Japan. *J Dent Health* 1997; 47: 240-249 [in Japanese].

48. Mackay J, Eriksen M. The Tobacco Atlas. 1st ed, p 96. Geneva: *World Health Organization*, 2002.

49. Davis RM. When doctors smoke. *Tob Control* 1993; 2: 187-188.

50. Glick M. Smoking cessation: No longer a choice. *J Am Dent Assoc* 2005; 136: 1076-1077.

Table 1 International Comparison of Tobacco Smoking Surveys Conducted among the Dental Profession between 1979 and 2005

Authors [a]	Year	Country	Rate [b]	Method	N	Response Rate [c]	Additional Findings
Kenna & Wood[17]	2005	United States	6%	Postal Survey	113	65%	More dentists smoked when compared to physicians
Hill & Braithwaite[30]	1997	United States	9%	Postal Survey	33	37%	More dentists smoked when compared to physicians
Hastreiter et al[34]	1994	United States	2%	Postal Survey	462	73%	Fewer dentists smoked when compared to dental hygienists
Brink et al[36]	1994	United States	1%	Postal Survey	79	76%	Fewer dentists smoked when compared to physicians
Logan et al[39]	1992	United States	6%	Postal Survey	1116	86%	A further 32% reported themselves to be ex-smokers
Fried & Cohen[40]	1992	United States	6%	Postal Survey	247	35%	A further 40% of dentists reported themselves to be ex-smokers
Secker-Walker et al[42]	1989	United States	5%	Postal Survey	196	78%	Smoking was significantly related to length of practice as a dentist
Laskin[43]	1987	United States	8%	Postal Survey	1349	28%	Non-smoking dentists were significantly younger than smokers
O'Shea & Corah[44]	1984	United States	18%	Postal Survey	376	81%	Most smoking dentists considered themselves to be 'light' smokers
Christen[45]	1984	United States	8%	Conference Survey	630	8%	Decade of graduation was roughly associated with smoking status
Lund et al[18]	2004	Norway	7%	Postal Survey	982	68%	Fewer dentists smoked when compared to dental hygienists
Gorter et al[24]	2000	Netherlands	16%	Postal Survey	709	75%	Male dentists were more likely to smoke than female dentists
Allard[25]	2000	Denmark	12%	Postal Survey	414	52%	A further 6% reported that they were occasional smokers
Allard[25]	2000	Netherlands	12%	Postal Survey	632	74%	Thirty percent of dentists had smoked at some point in the past
Allard[25]	2000	Sweden	10%	Postal Survey	520	65%	Thirty percent of dentists had smoked at some point in the past

Allard[25]	2000	Finland	3%	Postal Survey	412	53%	Over two-thirds of dentists had never smoked tobacco
Lodi et al[28]	1997	Italy	33%	Telephone Survey	217	87%	Smokers were considerably older than their non-smoking colleagues
Halling et al[33]	1995	Sweden	13%	Postal Survey	2628	90%	Male dentists were more likely to smoke than female dentists
Telivuo et al[41]	1991	Finland	11%	Postal Survey	435	81%	Male dentists were more likely to smoke than female dentists
Underwood et al[19]	2003	United Kingdom	9%	Postal Survey	537	75%	Male dentists were more likely to smoke than female dentists
John et al[22]	2003	Great Britain	8%	Postal Survey	696	71%	More recent graduates were more likely to have never smoked
Allard[25]	2000	United Kingdom	5%	Postal Survey	557	70%	Almost three-quarters of dentists had never smoked tobacco
Kay & Scarrott[27]	1997	United Kingdom	12%	Postal Survey	427	72%	No dentists reported smoking more than twenty cigarettes per day
John et al[29]	1997	Great Britain	9%	Postal Survey	674	78%	More recent graduates were more likely to have never smoked
Chestnutt & Binnie[31]	1995	Scotland	6%	Postal Survey	448	76%	A further 6% were occasional smokers and 17% ex-smokers
McCartan et al[38]	1993	Ireland	15%	Postal Survey	427	43%	Smoking prevalence was exactly the same in males and females
Smith & Leggat[16]	2005	Australia	4%	Postal Survey	281	72%	A higher smoking prevalence was seen among older dentists
Trotter & Worcester[21]	2003	Australia	4%	Telephone Survey	250	57%	Almost one-fifth of all dentists had been smokers in the past
Clover et al[26]	1999	Australia	3%	Postal Survey	95	70%	Almost one-third of dentists said they were ex-smokers
Mullins[37]	1994	Australia	6%	Telephone & Postal	128	d	More recent graduates were more likely to have never smoked
Dodds et al[46]	1979	Australia	23%	Postal Survey	305	87%	Male dentists were much more likely to smoke than females
Burgan[20]	2003	Jordan	35%	Postal Survey	613	72%	Older dentists were more likely to quit smoking than younger ones
Leggat et al[23]	2001	Thailand	2%	Postal Survey	178	81%	Male dentists were more likely to smoke than female dentists
Skegg et al[32]	1995	New Zealand	11%	Postal Survey	349	88%	3% of all dentists smoked pipes and cigars, rather than cigarettes

Campbell & Macdonald[35]	1994	Canada	4%	Postal Survey	765	64%	More recent graduates were more likely to have never smoked

[a] Including reference number as listed in this manuscript, [b] Smoking rates rounded to the nearest whole number, [c] Response rates rounded to the nearest whole number, [d] Initial non-respondents were replaced

Part 2

Tobacco Smoking among Doctors

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An International Comparison of Tobacco Smoking Habits among Physicians between 1974 and 2004

ABSTRACT

Objectives: To review systematically all modern literature describing the tobacco smoking habits of contemporary physicians. *Methods:* A keyword search of appropriate MeSH terms was initially undertaken to identify relevant material, after which the reference lists of manuscripts were also examined to locate further publications. *Results:* A total of 80 English-language studies published in the past 30 years met the inclusion criteria. Two distinct trends were evident. Firstly, most developed countries have shown a steady decline in physicians' smoking rates during recent years. On the other hand, physicians in some developed countries and many newly-developing regions appear to be smoking at high rates. The lowest overall smoking rates were consistently documented in the United States, Australia and the United Kingdom. Comparison with other health professionals suggests that physicians probably smoke less than nurses, but not as infrequently as dentists. *Conclusions:* Overall, this review suggests that while physicians' smoking habits vary from region to region, they are not uniformly low when viewed from an international perspective. It is important that smoking in the medical profession declines in future years, so that physicians can remain at the forefront of anti-smoking programs and lead the way as public health exemplars in the 21st century.

Introduction

The prevention of smoking represents a critical international priority for public health. According to the World Health Organization, tobacco is the second major cause of death and the fourth most common risk factor for disease, worldwide. If current trends continue it will be causing around 10 million deaths each year by 2020, with approximately 650 million fatalities overall [1]. Smoking also represents a key issue for physicians, as they play a lead role in the prevention of tobacco use in the community [2]. Physicians are on the frontlines of primary health care, and research has shown that medical interventions can be effective in helping patients to quit smoking [3]. In this role, physicians are widely viewed as exemplars by the community, their patients and their colleagues. The physicians' office and hospital should be a model of non-smoking behaviour [4], and, as early as 1976, it was suggested that physicians could best persuade patients to quit if they themselves did not smoke [5].

Aside from its significant impact on patients' health, tobacco usage also represents an important occupational health issue in the medical profession. According to the International Labour Office (ILO), the promotion of smoke-free environments forms a key part of any healthy and safe workplace [6]. Interestingly, some of the first epidemiological research, which demonstrated the adverse health effects of tobacco smoking, was actually conducted among a cohort of British physicians [7]. So important was Doll and Hill's 1954 study that it was republished by the British Medical Journal 50 years later [8] and remains a milestone in public health to this day [9-11]. Further research from the United

States (US) also supported their preliminary findings with regard to smoking hazards [12-14].

Although the dangers of smoking are now well-known throughout the medical profession, physicians have not always set a good example for patients [15]. In the 20th century for example, some physicians even advertised cigarettes in the US [16] and Japan [17]. Smoking rates among them were also high. Some of the earliest large-scale epidemiological research from the United States revealed that around 40% of physicians were smokers in 1959 [5], a figure which had fallen to 21% by the mid 1970s [18,19]. By the mid 1980s, around 17% of US physicians were still smoking cigarettes and 8% smoking pipes or cigars [20]. A large prospective study undertaken by the American Cancer Society in 1982 revealed a smoking prevalence of around 25% among physicians [21]. Subsequent National Health Interview Surveys found that the national smoking rate for physicians in the US had fallen dramatically between 1987 and 1994, and was below 10% by the mid 1990s [22-24].

Similar downward trends were also seen in Scandinavia during the latter half of last century [25-27]. Although these investigations suggest that physicians' smoking rates are probably declining in some parts of the world, international trends have not been clearly elucidated. Furthermore, few if any, researchers have systematically reviewed tobacco-smoking habits in the medical profession from an international perspective. The aim of this investigation therefore, was to undertake a comprehensive review of international tobacco smoking surveys, which have been conducted among physicians over the past 30 years.

Methods

An extensive review of the literature targeted all manuscripts published in peer-reviewed journals relating to the topic of tobacco smoking among physicians. As the nature of research changes over time and results quickly go out of date, only manuscripts which had been published in the previous 30 years were included. As there is always some delay between conducting a study and actually having it published, the most recent investigations on this topic had been conducted in 2004, and thus the search criteria were limited to articles published between 1974 and 2004. For consistency, only English-language reports were included. The literature review began with a Medline search of relevant Medical Subject Headings (MeSH) 'smoking', 'tobacco' and 'physician'. After identifying some initial studies, the search was repeated using keyword variations such as 'smoke' and 'doctor'. Manuscripts located using these initial criteria were subsequently examined to find additional publications in their reference list.

A large proportion of manuscripts were eventually located using the latter method. Manuscripts were arranged in descending order, depending on the year in which the survey was undertaken, rather than the publication year. Where such information was unavailable, the corresponding author of the manuscript was contacted for clarification. In cases where contact with the authors was not possible or repeatedly unsuccessful, manuscripts were listed by year of publication and marked with an asterisk. Manuscripts were assigned a reference number based on the abovementioned criteria. As the results of some investigations were published over more than one journal article, some

studies have two to three corresponding references. Smoking rates were listed as the prevalence of smoking among the entire group, and also as prevalence rates for males and females. In cases where smoking prevalence rates by gender were not stated in the manuscript itself, they were manually calculated whenever possible. For consistency, all smoking prevalence rates were rounded to the nearest whole number. Response rates for each study were also rounded to the nearest whole number for standardisation purposes. As some studies investigated multiple occupational groups which included physicians, some response rates were indicative of the entire group response, rather than just physicians. Where authors had apparently used a convenience sample with an unspecified response rate, this was also indicated on the table.

Results and Discussion

A total of 80 published studies met the inclusion criteria [28-112], as shown in Table 1. Most (n=48) had been conducted as postal surveys, 14 were hand delivered, 4 were telephone surveys, 3 were conducted by personal interview, 3 utilised census data and two had been conducted at conferences. A further 4 used both postal surveys and follow-up telephone interviews, while two used postal and hand delivery, mainly to increase response rates following the postal phase. The latter technique appears to have been quite successful in some cases, with one Malaysian study [75] achieving a 100% response rate in this regard. Response rates of the published studies ranged from 27% [100,101] to 100% [75], with most above 60%. Only four manuscripts had response rates below 50%, and three investigations did not list their response rate. One study from Iran appeared to have 100% participation [39], although a response rate

was not clearly stated and the authors were unable to be contacted to clarify their result, despite repeated attempts. A similar situation was encountered with a Greek study [69], where no response rate was listed and the authors were unable to be contacted. Among all manuscripts included in the current review, sample sizes ranged from 45 [29] to 10 807 [76], with an encouraging proportion having over 1000 respondents. Particularly large surveys of physicians' tobacco smoking habits were published from the Doctor's Health Study in the United Kingdom [76], the Physicians Health Study in the United States [65-67] and also from New Zealand census data [53,105,110], one of the few countries in the world which includes tobacco smoking questions on their census form [53].

One confounding factor across many investigations however, was a lack of standardisation regarding the definition of 'current smoker'. Although most authors referred to their subjects as being either smokers or non-smokers, some used recall periods ranging from one week to one month in their definition of the term 'current'. Others had no recall period. This may have arisen due to the inherent difficulties in assessing smoking habits over time, and the fact that most investigations simply described the point-prevalence of tobacco smoking among the surveyed group. Not all physicians smoked cigarettes either, with a study of Hispanic physicians in the United States [29] finding that 7% of their subjects smoked cigars, and none smoked cigarettes. In 1990 Doll et al [76] also revealed that a large proportion of their British physicians only smoked pipes or cigars, similar to Fowler et al's [88] earlier finding in the same country. Another confounding factor was that some studies appeared to use

convenience samples, rather than true random sampling. Furthermore, a certain proportion of manuscripts did not clearly describe their sample group or their entire research methodology in detail. Nevertheless, such investigations were in the minority, with a large proportion of all manuscripts located during this review having reasonable sample sizes in the hundreds, and sufficiently high response rates to allow confidence in the published data.

A large proportion of all research on physicians' tobacco smoking (51 of 80 studies) appears to have been conducted since 1990 [28-80]. Twenty three studies had been undertaken between 1980 and 1989 [81-106], with the remaining 6 investigations conducted prior to 1980 [107-112]. By country, 18 manuscripts in this review originated from the United States, 7 from Japan, 6 from Italy, 5 from the United Kingdom, 5 from Australia, 3 from New Zealand, and the remainder from other areas. When investigated from an international perspective, the overall prevalence of physician's smoking appears to have followed two distinct trends during this time. First of all, most developed countries have revealed a steady decline in physicians' smoking rates over the past 30 years. Since the year 2000 for example, four separate studies [29,30,36,42] have shown the prevalence of smoking among American physicians to be lower than 10%. Three investigations of their Australian counterparts in the 1990s [55-57] revealed a prevalence of around 5%, while in New Zealand, analysis of census data also suggested a similar rate during this period [53]. Tobacco use among British physicians has been well-studied longitudinally [10,11,76], although their smoking rate does not appear to be as low as the abovementioned countries, possibly due to the relatively large

number who continue to smoke pipes and cigars, rather than cigarettes. Nevertheless, overall tobacco consumption has still declined markedly, with Doll et al [76] revealing that the absolute proportion of British physicians who smoked cigars, pipes or cigarettes fell from 62% to 18% between 1951 and 1990. As the British Doctor's Study follows the same cohort longitudinally, this represents one of the clearest reductions in absolute tobacco smoking rates among physicians.

According to our review such trends may not be uniform across all countries however, with physicians in some developed regions still smoking at fairly high rates. Multiple investigations from Italy [40,47,52], Japan [41,50,61,77,82-84,99] and France [48,62] for example, have consistently documented smoking prevalence rates over 25%. A second trend is also evident in some newly developing countries, where contemporary physicians appear to be smoking at high rates in China [54], Estonia [31,32], Bosnia / Herzegovina [33] and Turkey [34]. In China, Li et al [54] reported that tobacco smoking rates among physicians have actually been increasing in recent years. A surprisingly low rate was found in Nigeria however (3%) [35], suggesting that exceptions are still possible in this latter group. The lowest overall smoking rate was documented in the United States (2%) [42,79], with similar low rates also being demonstrated in Australia (3%) [55] and the United Kingdom (3%) [92]. The highest smoking prevalence rate was recorded in Greece [69], where roughly half of all physicians (49%) reported themselves to be current smokers. Almost half of all Chinese (45%) [54] and Japanese physicians (43%) [99] were revealed to be current smokers in two separate studies. Similar results were also documented

in Kuwait (38%) and the United Arab Emirates (36%) [72], particularly among males (among whom 45% and 44% smoked, respectively). Almost half (48%) of all male Indian physicians from one study [95] were smoking. The proportion of ex-smoking physicians is also worth considering, with prevalence rates of 8% in Australia [56], 17% in the United States [42], 23% in Wales [90] and 52% in Canada [71], being previously documented.

For current smokers by gender, the highest smoking prevalence rates were 61% among male physicians in China [54] and 34% among female physicians in Italy [52]. Two investigations from France also found that one-quarter of their female physicians smoked tobacco on a regular basis [48,62]. Conversely, other research from China [28], Malaysia [75], Wales [90] and Hong Kong [93] revealed no female smokers at all. This may suggest a cultural reluctance for professional women to smoke in certain regions, such as Asia. An important observation during our review was the relatively large number of studies where male physicians smoked at higher rates than their female counterparts. This finding was not without exception however. In Italy for example, Zanetti et al [52] found that more women doctors smoked than men, while in Israel [51], Australia [57] and the United States [87], smoking prevalence rates were almost the same between the genders.

A large proportion of manuscripts did not divide their smoking prevalence rates by sex however, making it impossible to do further gender comparisons. Many authors documented age-related differences in physicians' smoking rates, with older physicians for the most part, more likely to be current smokers.

Nevertheless, in China [28], Japan [61,99], Mexico [68] and India [95], tobacco usage was actually more prevalent in younger physicians. Again, these conflicting results suggest that some age-related tobacco associations should probably be treated with caution.

Aside from overall prevalence rates, additional useful information was also obtained with regard to physician's tobacco smoking habits. Firstly, some studies simultaneously investigated the tobacco usage habits of dentists, nurses and other hospital staff while surveying doctors. Two investigations from the United States [30,60] found that fewer physicians smoked when compared to dentists, while another study demonstrated very similar, albeit very low, smoking rates between the two professional groups [79]. In 1979, Wyshak et al [107] found that physicians were less likely to be current smokers than lawyers. Most studies found that fewer physicians smoked when compared to nurses at the same facility, although an investigation from Finland [70] suggested the opposite situation may sometimes occur. Even so, physicians in most societies tend to give up smoking before other occupational groups and the general public for a number of reasons [15].

Firstly, they may recognise the negative medical consequences more quickly than the general public. Secondly, their devotion to health naturally conflicts with unhealthy behaviours. Thirdly, tobacco smoking usually incurs a negative image in the health-care profession long before it does so in the wider community [15]. In this regard, doctors are well equipped to evaluate scientific knowledge, and can reasonably be expected to act upon new discoveries if

warranted [113]. Furthermore, smoking rates in developed countries tend to decrease over time due to a generational effect, as the social climate of a country changes and more people give up smoking, doctors included [85].

Tobacco smoking by medical specialty also revealed some interesting, though inconsistent, results during this review. One study for example, found that family physicians smoked less than physicians generally [66], while two others suggested that general practitioners smoked more often than specialists [78,85]. In the Netherlands, more consultants smoked than house officers [81]. Trainee psychiatrists [57] and psychiatry residents [91] were the most likely to smoke in some investigations, while in others it was surgeons [69], obstetricians [110] or surgeons and obstetricians [108]. Encouragingly, Kawane et al [82-84] demonstrated that Japanese chest physicians had a lower smoking rate than Japanese physicians, generally. Exactly how much a physician's medical specialty influences their smoking habits is uncertain. A previous study of Malaysian doctors for example [75] found that around half were already smoking before they entered medical school. Based on the findings of multiple investigations therefore, it is very difficult to ascertain which medical specialty actually has the highest or lowest smoking rate.

Regarding antismoking practices, most physicians in a British study [46] felt they should advise patients to quit, and in France [73] over half the tobacco using physicians had made at least one serious attempt to quit smoking themselves. In Italy however [96], more than half the physicians who currently smoked had made no attempt to quit smoking, and in Japan [63] only 60% of

smokers stated any intention of reducing their tobacco consumption or quitting altogether. Other authors have already suggested that Japanese physicians may not be setting a good example in this regard [114]. The institutions where doctors work may also play an important role in tobacco control, with an American study [94] demonstrating that a hospital no-smoking policy was useful in helping to reduce the overall smoking rate among staff. Hospitals in the United States were the first industry to declare a national smoking ban in the early 1990s, and were ones which later influenced social norms and probably reduced overall smoking rates [115]. Even so, the actual hospital in which physicians work, as well as the geographical location where they live may not always affect the smoking rates of physicians in the same country. One Italian study for example found different smoking rates by region [40], although in Nigeria [35] smoking rates of physicians in two different hospitals were exactly the same, with both being encouragingly low (3%). A doctor's smoking habit may also influence his or her spouse, with separate studies from Scotland [102] and New Zealand [116] revealing that around half of all male physicians who smoked, also had smoking wives.

How much a physician's personal smoking behaviour affects their professional attitude and clinical behaviour represents a critical issue in public health, as physicians are on the frontlines of primary health care. Although medical professionals have many opportunities to reduce the prevalence of smoking among their patients, physicians may have not yet maximized their efforts in meeting the tobacco epidemic. Doctors incur a certain responsibility as exemplars for patients with regard to healthy behaviour [117], as well as the

public image they inadvertently portray outside of the work environment [118]. Having any physicians who smoke may increase public scepticism, with people inclined to ask why they should stop smoking when doctors don't? [119]. Tobacco use by health care workers undermines the message to smokers that quitting is important [120], and as early as 1976 it was suggested that physicians could best persuade patients to quit if they themselves did not smoke [5]. In 1983, Sachs [100] stated that 80% of US citizens expected their physicians to be non-smokers, and in 1984, Wells et al [108] suggested that physicians with good personal health habits counsel their patients significantly more about all health habits. As physicians gain more insight into their own health and health habits, their advice to patients becomes increasingly relevant and effective [121]. Although methods for treating tobacco dependence in clinical practice have been described elsewhere [122-124], the entire process need not be overly taxing for physicians. At the most basic level, such interventions may require them to ask only two questions: 'do you smoke?' and 'do you want to quit?' [122]. Nevertheless, such guidelines are not always followed for a variety of reasons.

The extent to which the professional practice of physicians is affected by their own smoking habits has been examined in certain investigations. One of the most marked differences in this regard was found in Greece [69] where only half the smoking physicians were involved in smoking cessation counseling, compared to 100% of their non-smoking colleagues. Several Japanese studies revealed differences in smoking-cessation advice [63] and taking a patient's smoking history [50], with both being significantly more commonplace among

non-smoking physicians. Similar findings were also seen in Finland [37]. Pärna et al [31] revealed that Estonian physicians who smoked were reluctant to disturb patient's privacy by asking about their tobacco usage. Knowledge of smoking-related damage also showed correlations with smoking behaviour in an Italian study [47], although their analysis included other health professionals as well as physicians.

Not all studies revealed differences however. In Israel for example, Samuels [51] asked physicians whether or not they advised patients to stop smoking during consultations, and found no difference between smokers and non-smokers. A longitudinal study of Chinese physicians also revealed that the effects of smoking on counseling behaviour varied between 1987 and 1996 [54]. In 1987 for example, smoking behaviour was an influential factor, whereas by 1996 it had ceased to be so. Other confounding issues were raised by the Chinese study. Firstly, only one-third of physicians believed that they were the most influential person who could help patients quit. On the other hand, over three-quarters of them believed that physicians can set a good example for patients by not smoking. Most disturbingly, anti-smoking counselling practices appear to be diminishing among Chinese physicians in recent years, while their overall prevalence of smoking is probably increasing during the same time [54]. These discrepancies between various countries suggest that not only are physician-targeted smoking interventions urgently needed in public health, but that they will should also be culturally specific.

Conclusion

Overall, this review suggests that while physicians' smoking habits vary from region to region, they are not uniformly low when viewed from an international perspective. Comparison with other health professionals suggests that physicians probably smoke less than nurses in the same location, but not as infrequently as dentists. The fact that physicians smoke at all is unfortunate given their status as exemplars, and implies that further preventive efforts need to be focussed on physicians' personal health behaviours. It is important therefore that smoking in the medical profession declines in future years, particularly in developing countries, so that physicians can remain at the forefront of anti-smoking programs and lead the way as public health exemplars in the 21st century.

References

[1] *World Health Organization* (WHO). Why is tobacco a public health priority? Available online at: http://www.who.int/tobacco/health_priority/en/index.html (accessed Feb 2006)

[2] Centers for Disease Control and Prevention (CDC). Physician and other health-care professional counseling of smokers to quit - United States, 1991. *MMWR Morb Mortal Wkly Rep* 1993;42:854-7.

[3] Fowler G. Educating doctors in smoking cessation. *Tob Control* 1993;2:5-6.

[4] Nett LM. The physician's role in smoking cessation: A present and future agenda. *Chest* 1990; 97(Suppl. 2):S28-32.

[5] Garfinkel L. Cigarette smoking among physicians and other health professionals, 1959-1972. *CA Cancer J Clin* 1976;26:373-5.

[6] Håkansta C. Workplace Smoking. Working Paper: A review of national and local practical and regulatory measures. pp 1-89, Geneva: *International Labor Office* (ILO), 2004.

[7] Doll R, Hill AB. The mortality of doctors in relation to their smoking habits: A preliminary report. *BMJ* 1954;4877:1451-5.

[8] Doll R, Hill AB. The mortality of doctors in relation to their smoking habits: A preliminary report. 1954. *BMJ* 2004;328:1529-33.

[9] Stampfer M. New insights from the British doctors study. *BMJ* 2004;328:1507.

[10] Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004;328:1519, EPub 2004 Jun.

[11] Doll R, Peto R, Boreham J, Sutherland I. Mortality from cancer in relation to smoking: 50 years observations on British doctors. *Br J Cancer* 2005;92:426-29.

[12] Hammond EC, Horn D. Smoking and death rates - Report on forty-four months of follow-up of 187,783 men. I: Total mortality. *JAMA* 1958;166:1159-72.

[13] Hammond EC, Horn D. Smoking and death rates - Report on forty-four months of follow-up of 187,783 men. II: Death rates by cause. *JAMA* 1958;166:1294-308.

[14] Hammond EC, Horn D. Landmark article March 15, 1958: Smoking and death rates - Report on forty-four months of follow-up of 187,783 men.*JAMA* 1984;251:2840-53.

[15] Davis RM. When doctors smoke. *Tob Control* 1993;2:187-8.

[16] Gardner MN, Brandt AM. The Doctors' Choice Is America's Choice: The Physician in US Cigarette Advertisements, 1930-1953. *Am J Public Health* 2006;96:222-32.

[17] Kawane H. When doctors advertised cigarettes. *Tob Control* 1993;2:45.

[18] Centers for Disease Control and Prevention (CDC). Smoking behavior and attitudes of physicians, dentists, nurses, and pharmacists, 1975. *MMWR Morb Mortal Wkly Rep* 1977;26:185.

[19] Sterling TD, Weinkam JJ. Smoking characteristics by type of employment. *J Occup Med* 1976;18:743-54.

[20] Garfinkel L, Stellman SD. Cigarette smoking among physicians, dentists, and nurses. *CA Cancer J Clin* 1986;36:2-8.

[21] Stellman SD, Boffetta P, Garfinkel L. Smoking habits of 800 000 American men and women in relation to their occupations. *Am J Ind Med* 1988;13:43-58.

[22] Nelson DE, Giovino GA, Emont SL, Brackbill R, Cameron LL, Peddicord J, et al. Trends in cigarette smoking among US physicians and nurses. *JAMA* 1994;271:1273-5.

[23] Nelson DE, Emont SL, Brackbill RM, Cameron LL, Peddicord J, Fiore MC. Cigarette smoking prevalence by occupation in the United States. A comparison between 1978 to 1980 and 1987 to 1990. *J Occup Med* 1994;36:516-25.

[24] Lee DJ, LeBlanc W, Fleming LE, Gomez-Marin O, Pitman T. Trends in US smoking rates in occupational groups: The National Health Interview Survey 1987-1994. *J Occup Environ Med* 2004;46:538-48.

[25] van Reek J, Adriaanse H. Smoking by physicians in Scandinavia: 1952-1989. *Scand J Soc Med* 1991;19:256-9.

[26] Adriaanse H, van Reek J, Metsemakers J. Smoking behaviour of Dutch general practitioners in the period 1977-1983. *Scand J Prim Health Care* 1986;4:151-6.

[27] Adriaanse H, Halfens R, Drop MJ, van Reek J. Physicians, smoking, and health in the Netherlands. *NY State J Med* 1985;85:394-5.

[28] Smith DR, Wei N, Zhang YJ, Wang RS. Tobacco smoking habits among a cross-section of rural physicians in China. *Aust J Rural Health* 2006;14:66-71.

[29] Soto Mas FG, Papenfuss RL, Jacobson HE, Hsu CE, Urrutia-Rojas X, Kane WM. Hispanic physicians' tobacco intervention practices: A cross-sectional survey study. *BMC Public Health* 2005;5:120.

[30] Kenna GA, Wood MD. The prevalence of alcohol, cigarette and illicit drug use and problems among dentists. *J Am Dent Assoc* 2005;136:1023-32.

[31] Parna K, Rahu K, Rahu M. Smoking habits and attitudes towards smoking among Estonian physicians. *Public Health* 2005;119:390-9.

[32] Parna K, Rahu K, Barengo NC, Rahu M, Sandstrom PH, Jormanainen VJ, et al. Comparison of knowledge, attitudes and behaviour regarding smoking among Estonian and Finnish physicians. *Soz Praventivmed* 2005;50:378-88.

[33] Hodgetts G, Broers T, Godwin M. Smoking behaviour, knowledge and attitudes among Family Medicine physicians and nurses in Bosnia and Herzegovina. *BMC Fam Pract* 2004;5:12.

[34] Gunes G, Karaoglu L, Genc MF, Pehlivan E, Egri M. University hospital physicians' attitudes and practices for smoking cessation counseling in Malatya, Turkey. *Patient Educ Couns* 2005;56:147-53.

[35] Nollen NL, Adewale S, Okuyemi KS, Ahluwalia JS, Parakoyi A. Workplace tobacco policies and smoking cessation practices of physicians. *J Natl Med Assoc* 2004;96:838-42.

[36] Misra R, Vadaparampil ST. Personal cancer prevention and screening practices among Asian Indian physicians in the United States. *Cancer Detect Prev* 2004;28:269-76.

[37] Barengo NC, Sandstrom HP, Jormanainen VJ, Myllykangas MT. Attitudes and behaviours in smoking cessation among general practitioners in Finland 2001. *Soz Praventivmed* 2005;50:355-60.

[38] Kannegaard PN, Kreiner S, Gregersen P, Goldstein H. Smoking habits and attitudes to smoking 2001 among hospital staff at a Danish hospital Comparison with a similar study 1999. *Prev Med* 2005;41:321-7.

[39] Ahmadi J, Khalili H, Jooybar R, Namazi N, Aghaei PM. Cigarette smoking among Iranian medical students, resident physicians and attending physicians. *Eur J Med Res* 2001;6:406-8.

[40] Pizzo AM, Chellini E, Grazzini G, Cardone A, Badellino F. Italian general practitioners and smoking cessation strategies. *Tumori* 2003;89:250-4.

[41] Ohida T, Sakurai H, Mochizuki Y, Kamal AM, Takemura S, Minowa M, et al. Smoking prevalence and attitudes toward smoking among Japanese physicians. *JAMA* 2001;285:2643-8.

[42] An LC, Bernhardt TS, Bluhm J, Bland P, Center B, Ahluwalia JS, et al. Treatment of tobacco use as a chronic medical condition: Primary care physicians' self-reported practice patterns. *Prev Med* 2004;38:574-85.

[43] La Vecchia C, Scarpino V, Malvezzi I, Baldi G. A survey of smoking among Italian doctors. *J Epidemiol Community Health* 2000;54:320.

[44] Power B, Neilson S, Perry IJ. Perception of the risks of smoking in the general population and among general practitioners in Ireland. *Ir J Med Sci* 2004;173:141-4.

[45] Willaing I, Jørgensen T, Iversen L. How does individual smoking behaviour among hospital staff influence their knowledge of the health consequences of smoking? *Scand J Public Health* 2003;31:149-55.

[46] McEwen A, West R. Smoking cessation activities by general practitioners and practice nurses. *Tob Control* 2001;10:27-32.

[47] Nardini S, Bertoletti R, Rastelli V, Ravelli L, Donner CF. Personal smoking habit and attitude toward smoking among the health staff of a general hospital. *Monaldi Arch Chest Dis* 1998;53:74-8.

[48] Josseran L, King G, Guilbert P, Davis J, Brucker G. Smoking by French general practitioners: Behaviour, attitudes and practice. *Eur J Public Health* 2005;15:33-8.

[49] Hepburn MJ, Johnson JM, Ward JA, Longfield JN. A survey of smoking cessation knowledge, training, and practice among U.S. Army general medical officers. *Am J Prev Med* 2000;18:300-4.

[50] Kawahara K, Ohida T, Osaki Y, Mochizuki Y, Minowa M, Yamaguchi N, et al. Study of the smoking behavior of medical doctors in Fukui, Japan and their antismoking measures. *J Epidemiol* 2000;10:157-62.

[51] Samuels N. Smoking among hospital doctors in Israel and their attitudes regarding anti-smoking legislation. *Public Health* 1997;111:285-8.

[52] Zanetti F, Gambi A, Bergamaschi A, Gentilini F, De Luca G, Monti C, et al. Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health* 1998;112:57-62.

[53] Hay DR. Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. *NZ Med J* 1998;111:102-4.

[54] Li HZ, Fish D, Zhou X. Increase in cigarette smoking and decline of anti-smoking counselling among Chinese physicians: 1987-1996. *Health Prom Int* 1999;14:123-31.

[55] Young JM, Ward JE. Declining rates of smoking among medical practitioners. *Med J Aust* 1997;167:232.

[56] Roche AM, Parle MD, Saunders JB. Managing alcohol and drug problems in general practice: A survey of trainees' knowledge, attitudes and educational requirements. *Aust NZ J Public Health* 1996;20:401-8.

[57] Roche AM, Parle MD, Stubbs JM, Hall W, Saunders JB. Management and treatment efficacy of drug and alcohol problems: What do doctors believe? *Addiction* 1995;90:1357-66.

[58] Barengo NC, Sandstrom PH, Jormanainen VJ, Myllykangas MT. Changes in smoking prevalence among Finnish physicians 1990-2001. *Eur J Public Health* 2004;14:201-3.

[59] Nardini S, Bertoletti R, Rastelli V, Donner CF. The influence of personal tobacco smoking on the clinical practice of Italian chest physicians. *Eur Respir J* 1998;12:1450-3.

[60] Hill HA, Braithwaite RL. Attitudes, beliefs, and practices regarding smoking and smoking cessation among African-American physicians and dentists. *J Natl Med Assoc* 1997;89:745-51.

[61] Kawane H, Soejima R. Smoking among doctors in a medical school hospital. *Kawasaki Med J* 1996;22:211-6.

[62] Josseran L, King G, Velter A, Dressen C, Grizeau D. Smoking behavior and opinions of French general practitioners. *J Natl Med Assoc* 2000;92:382-90.

[63] Kawakami M, Nakamura S, Fumimoto H, Takizawa J, Baba M. Relation between smoking status of physicians and their enthusiasm to offer smoking cessation advice. *Intern Med* 1997;36:162-5.

[64] Grossman DW, Knox JJ, Nash C, Jimenez JG. Smoking: Attitudes of Costa Rican physicians and opportunities for intervention. *Bull World Health Organ* 1999;77:315-22.

[65] Frank E. The Women Physicians' Health Study: Background, objectives, and methods. *J Am Med Womens Assoc* 1995;50:64-6.

[66] Frank E, Lutz LJ. Characteristics of women US family physicians. *Arch Fam Med* 1999;8:313-8.

[67] Frank E, Rothenberg R, Lewis C, Belodoff BF. Correlates of physicians' prevention-related practices. Findings from the Women Physicians' Health Study. *Arch Fam Med* 2000;9:359-67.

[68] Tapia-Conyer R, Cravioto P, de la Rosa B, Galvan F, Garcia-de la Torre G, Kuri P. Cigarette smoking; knowledge and attitudes among Mexican physicians. *Salud Publica Mex* 1997;39:507-12.

[69] Polyzos A, Gennatas C, Veslemes M, Daskalopoulou E, Stamatiadis D, Katsilambros N. The smoking-cessation promotion practices of physician smokers in Greece. *J Cancer Educ* 1995;10:78-81.

[70] Heloma A, Reijula K, Tikkanen J, Nykyri E. The attitudes of occupational health personnel to smoking at work. *Am J Ind Med* 1998;34,73-8.

[71] De Koninck M, Guay H, Bourbonnais R, Bergeron P. Physical, mental, and reproductive health of Quebec women physicians. *J Am Med Womens Assoc* 1995;50:59-63.

[72] Bener A, Gomes J, Anderson JAD. Smoking habits among physicians in two gulf countries. *J R Soc Health* 1993;113:298-301.

[73] Tessier JF, René L, Nejjari C, Belougne D, Moulin J, Freour P. Attitudes and opinions of French general practitioners towards tobacco. *Tob Control* 1993;2:226-30.

[74] Hussain SF, Tjeder-Burton S, Campbell IA, Davies PD. Attitudes to smoking and smoking habits among hospital staff. *Thorax* 1993;48:174-5.

[75] Yaacob I, Abdullah ZA. Smoking habits and attitudes among doctors in a Malaysian hospital. *Southeast Asian J Trop Med Public Health* 1993;24:28-31.

[76] Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. *BMJ* 1994;309:901-11.

[77] Kaetsu A, Fukushima T, Moriyama M, Shigematsu T. Change of the smoking behavior and related lifestyle variables among physicians in Fukuoka, Japan: A longitudinal study. *J Epidemiol* 2002;12:208-16.

[78] Jormanainen VJ, Myllykangas MT, Nissinen A. Decreasing the prevalence of smoking among Finnish physicians. *Eur J Public Health* 1997;7:318-20.

[79] Brink SG, Gottlieb NH, McLeroy KR, Wisotzky M, Burdine JN. A community view of smoking cessation counselling in the practices of physicians and dentists. *Public Health Rep* 1994;109:135-42.

[80] Hensrud DD, Sprafka JM. The smoking habits of Minnesota physicians. *Am J Pub Health* 1993;83:415-7.

[81] Waalkens HJ, Cohen Schotanus J, Adriaanse H, Knol K. Smoking habits in medical students and physicians in Groningen, The Netherlands. *Eur Respir J* 1992;5:49-52.

[82] Kawane H. Smoking among Japanese physicians. JAMA 2001;286:917

[83] Kawane H. The prevalence of smoking among physicians in Japan. *Am J Public Health* 1993;83:1640.

[84] Kawane H. Smoking among older chest physicians. *Chest* 1991;99:526.

[85] Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. *Soc Sci Med* 1993;36:817-22.

[86] Hughes PH, Brandenburg N, Baldwin DC Jr, Storr CL, Williams KM, Anthony JC, et al. Prevalence of substance use among US physicians. *JAMA* 1992;267:2333-9.

[87] Scott HD, Tierney JT, Buechner JS, Waters WJ Jr. Smoking rates among Rhode Island physicians: Achieving a smoke-free society. *Am J Prev Med* 1992;8:86-90.

[88] Fowler G, Mant D, Fuller A, Jones L. The "Help Your Patient Stop" initiative. Evaluation of smoking prevalence and dissemination of WHO/UICC guidelines in UK general practice. *Lancet* 1989;1:1253-5.

[89] Saeed AA. Attitudes and behaviour of physicians towards smoking in Riyadh city, Saudi Arabia. *Trop Geogr Med* 1991;43:76-9.

[90] Nutbeam D, Catford J. Modifiable risks for cardiovascular disease among general practitioners in Wales. *Public Health* 1990;104:353-61.

[91] Hughes PH, Baldwin DC Jr, Sheehan DV, Conard S, Storr CL. Resident physician substance use, by specialty. *Am J Psychiatry* 1992;149:1348-54.

[92] Davies PD, Rajan K. Attitudes to smoking and smoking habit among the staff of a hospital. *Thorax* 1989;44:378-81.

[93] Cheng KK, Lam TH. Smoking among young doctors in Hong Kong: A message to medical educators. *Med Educ* 1990;24:158-63.

[94] Stillman FA, Becker DM, Swank RT, Hantula D, Moses H, Glantz S, et al. Ending smoking at the Johns Hopkins Medical Institutions. An evaluation of smoking prevalence and indoor air pollution. *JAMA* 1990;264:1565-9.

[95] Sarkar D, Dhand R, Malhotra A, Malhotra S, Sharma BK. Perceptions and attitude towards tobacco smoking among doctors in Chandigarh. *Indian J Chest Dis Allied Sci* 1990;32:1-9.

[96] Franceschi S, Serraino D, Talamini R, Candiani E. Personal habits and attitudes towards smoking in a sample of physicians from the north-east of Italy. *Int J Epidemiol* 1986;15:584-5.

[97] Linn LS, Yager J, Cope D, Leake B. Health habits and coping behaviors among practicing physicians. *West J Med* 1986;144:484-9.

[98] Joossens L, Demedts M, Prignot J, Bartsch P, Gyselen A. Smoking habits of Belgian physicians: Effects of consonancy behaviour and of age. *Acta Clin Belg* 1987;42:457-61.

[99] Kaetsu A, Fukushima T, Moriyama M, Shigematsu T. Smoking behavior and related lifestyle variables among physicians in Fukuoka, Japan: A cross sectional study. *J Epidemiol* 2002;12:199-207.

[100] Sachs DP. Smoking habits of pulmonary physicians. *N Engl J Med* 1983;309:799.

[101] Sachs DP. Treatment of cigarette dependency. What American pulmonary physicians do. *Am Rev Respir Dis* 1984;129:1010-3.

[102] Seiler ER. Smoking habits of doctors and their spouses in south east Scotland. *J R Coll Gen Pract* 1983;33:598.

[103] Senior SL. Study of smoking habits in hospital and attitudes of medical staff towards smoking. *CMAJ* 1982;126:131-3.

[104] Fortmann SP, Sallis JF, Magnus PM, Farquhar JW. Attitudes and practices of physicians regarding hypertension and smoking: The Stanford Five City Project. *Prev Med* 1985;14:70-80.

[105] Hay DR. Intercensal trends in cigarette smoking by New Zealand doctors and nurses. *NZ Med J* 1984;97:253-5.

[106] Ballal SG. Cigarette smoking and respiratory symptoms among Sudanese doctors. *East Afr Med J* 1984;61:95-103.

[107] Wyshak G, Lamb GA, Lawrence RS, Curran WJ. A profile of the health-promoting behaviors of physicians and lawyers. *N Engl J Med* 1980;303:104-7.

[108] Wells KB, Lewis CE, Leake B, Ware JE Jr. Do physicians preach what they practice? A study of physicians' health habits and counseling practices. *JAMA* 1984;252:2846-8.

[109] Dodds AM, Rankin DW, Hill DJ, Gray NJ. Attitudes and smoking habits of doctors in Victoria. *Community Health Studies* 1979;3:28-31.

[110] Hay DR. Cigarette smoking by New Zealand doctors: Results from the 1976 population census. *NZ Med J* 1980;91:285-8.

[111] Aaro LE, Bjartveit K, Vellar OD, Berglund EL. Smoking habits among Norwegian doctors 1974. *Scand J Soc Med* 1977;5:127-35.

[112] Rankin DW, Gray NJ, Hill DJ, Evans DR. Attitudes and smoking habits of Australian doctors. *Med J Aust* 1975;2:822-4.

[113] Christmas BW, Hay DR. The smoking habits of New Zealand doctors: A review after ten years. *NZ Med J* 1976;83:391-4.

[114] Audet B. When it comes to smoking, Japanese MDs do not set a good example for their patients. *CMAJ* 1994;150:1673-4.

[115] Bartscherer DJ, Reichert VC, Folan P, Degaetano C, Jacobsen DR, Miceli L, et al. Tobacco and the health care industry. *Clin Occup Environ Med* 2005;5:55-71.

[116] Hay DR, Christmas BW. The smoking habits of women doctors and doctors' wives in New Zealand. *Prev Med* 1976;5:78-88.

[117] Adriaanse H, van Reek J. Physicians' smoking and its exemplary effect. *Scand J Prim Health Care* 1989;7:193-6.

[118] Anon. Smoking and health: A physician's responsibility. A statement of the joint committee on smoking and health. American College of Chest Physicians, American Thoracic Society, Asia Pacific Society of Respirology, Canadian Thoracic Society, European Respiratory Society, International Union Against Tuberculosis and Lung Disease. *Eur Respir J* 1995;8:1808-11.

[119] Chapman S. Doctors who smoke. *BMJ* 1995;311:142-3.

[120] Centers for Disease Control and Prevention (CDC). Smoking control among health-care workers - World No-Tobacco Day, 1993. *MMWR Morb Mortal Wkly Rep* 1993;42:365-7.

[121] Clever LH, Arsham GM. Physicians' own health - some advice for the advisors. *West J Med* 1984;141:846-54.

[122] Fiore MC, Bailey WC, Cohen SJ, Dorfman SF, Goldstein MG, Gritz ER, et al. Treating Tobacco Use and Dependence. Quick Reference Guide for

Clinicians. Rockville, MD: *U.S. Department of Health and Human Services.* Public Health Service. October 2000.

[123] Raw M, McNeill A, West R. Smoking cessation guidelines for health professionals. A guide to effective smoking cessation interventions for the health care system. Health Education Authority. *Thorax* 1998;53 Suppl 5, Pt 1:S1-19.

[124] Zwar N, Richmond R, Borland R, Stillman S, Cunningham M, Litt J. Smoking cessation guidelines for Australian general practice. *Aust Fam Physician* 2005;34:461-6.

Table 1 International Comparison of Tobacco Smoking Surveys Conducted among Physicians between 1974 and 2005

Publication Details			Smoking Rate [c]			Study Details			
Authors [a]	**Year** [b]	**Country**	**All**	**Male**	**Female**	**Methodology**	**Sample Size**	**Response Rate** [d]	**Additional Findings**
Smith et al [28]	2004	China	16%	32%	0%	Hand Delivered	286	79%	Physicians younger than 25 had the lowest smoking rate
Soto Mas et al [29]	2002-03	United States [e]	7%	-	-	Postal Survey	45	56%	No physicians reported being current cigarette smokers
Kenna & Wood [30]	2002	United States	4%	-	-	Postal Survey	104	63%	Fewer physicians smoked when compared to dentists
Pärna et al [31,32]	2002	Estonia	-	25%	11%	Postal Survey	2668	68%	Twice as many males as females were ex-smokers
Hodgetts et al [33]	2002	Bosnia & Herzegovina	40%	-	-	Hand Delivered	112	73%	Fewer physicians smoked when compared to nurses
Gunes et al [34]	2002	Turkey	38%	-	-	Hand Delivered	257	85%	Around one-fifth of smokers were only occasional smokers
Nollen et al [35]	2002	Nigeria	3%	-	-	Hand Delivered	373	60%	Smoking rates in two different hospitals were the same
Misra & Vadaparampil [36]	2001-02	United States [f]	3%	-	-	Postal Survey	254	37%	The smoking status of a further 6% of physicians was not defined
Barengo et al [37]	2001	Finland	-	5%	3%	Postal Survey	3057	69%	Occasional smoking was more common among male physicians
Kannegaard et al [38]	2001	Denmark	15%	-	-	Postal Survey	729	75%	Physicians smoking rate fell 4% between 1999 and 2001
Ahmadi et al [39]	2001*	Iran	9%	-	-	Hand Delivered	111	n/sg	Residents had a higher smoking rate than attending physicians
Pizzo et al [40]	2000	Italy	28%	32%	20%	Telephone Survey	526	72%	Physician smoking rates differed by geographical region
Ohida et al [41]	2000	Japan	-	27%	7%	Postal Survey	3771	84%	Male physicians aged 40-49 had the highest smoking rate
An et al [42]	2000	United States	2%	-	-	Postal Survey	750	61%	A further 17% of physicians had ever smoked in the past
La Vecchia et al [43]	1999	Italy	24%	25%	23%	Interview	501	n/s	Physicians aged 41-50 had the highest smoking rate

Power et al [44]	1999	Ireland	16%	-	-	Telephone Survey	171	85%	Most physicians understood the dangers of smoking
Williang et al [45]	1999	Denmark	25%	-	-	Postal Survey	445	91%	Fewer physicians smoked when compared to nurses
McEwan & West [46]	1999	United Kingdom	4%	-	-	Postal and Telephone	303	75%	Most physicians felt they should advise patients to quit
Nardini et al [47]	1998*	Italy	39%	-	-	Hand Delivered	959	57%	Fewer physicians smoked when compared to nurses
Josseran et al [48]	1998	France	32%	34%	25%	Telephone Survey	2073	67%	Physicians older than 40 had the highest smoking rate
Hepburn et al [49]	1997	United States	11%	-	-	Postal Survey	150	65%	More than half of the smokers used smokeless tobacco
Kawahara et al [50]	1996-97	Japan	26%	28%	5%	Postal Survey	709	91%	Physicians aged 40-49 years had the highest smoking rate
Samuels [51]	1996	Israel	16%	16%	15%	Interview	260	87%	The highest smoking rate was seen among radiologists
Zanetti et al [52]	1996	Italy	31%	29%	34%	Hand Delivered	2453	68%	Fewer physicians smoked when compared to nurses
Hay [53]	1996	New Zealand	5%	5%	5%	Census Data	7335	97%h	Fewer physicians smoked when compared to nurses
Li et al [54]	1996	China	45%	61%	12%	Hand Delivered	493	82%	Smoking rates have increased dramatically in recent years
Young & Ward [55]	1996	Australia	3%	4%	2%	Postal Survey	855	67%	Older physicians were more likely to be current smokers
Roche et al [56]	1996*	Australia	4%	-	-	Postal Survey	908	55%	A further 8% said they had previously smoked tobacco
Roche et al [57]	1995*	Australia	6%	6%	5%	Postal Survey	1365	55%	Trainee psychiatrists were more likely to be smokers
Barengo et al [58]	1995	Finland	-	7%	3%	Postal Survey	1221	76%	Male physicians older than 45 had the highest smoking rate
Nardini et al [59]	1995	Italy	25%	-	-	Conference Survey	605	62%	Physicians aged 40-50 years had the highest smoking rate
Hill & Braithwaite [60]	1994	United States i	4%	-	-	Postal Survey	121	32%	Fewer physicians smoked when compared to dentists
Kawane & Soejima [61]	1994	Japan	29%	-	-	Hand Delivered	163	60%	Younger physicians had the highest smoking rates
Josseran et al [62]	1994	France	34%	36%	25%	Telephone Survey	1013	65%	Male physicians were also heavier smokers than female physicians

Kawakami et al [63]	1994	Japan	21%	24%	7%	Postal Survey	323	71%	Only 60% of smokers intended to reduce or quit their habit in future
Grossman et al [64]	1993-94	Costa Rica	19%	-	-	Hand Delivered	217	76%	88% of smokers intended to reduce or quit their habit in future
Frank et al [65-67]	1993-94	United States	-	-	4%	Postal Survey	4501	59%	Fewer family physicians smoked than physicians, generally
Tapia-Conyer et al [68]	1993	Mexico	27%	30%	21%	Postal Survey	3488	98%	Physicians aged 33-43 years had the highest smoking rate
Polyzos et al [69]	1992	Greece	49%	-	-	Hand Delivered	148	n/s	Surgeons had a higher smoking rate than internists
Heloma et al [70]	1992	Finland	10%	-	-	Postal Survey	725	72%	More physicians smoked when compared to nurses
De Koninck et al [71]	1991-92	Canada	-	13%	7%	Postal Survey	1540	51%	Over half of all male physicians had previously smoked
Bener et al [72]	1991-92	Arab Emirates	36%	44%	8%	Postal Survey	275	92%	Almost half the smokers were aged over 45 years
Tessier et al [73]	1991	France	21%	22%	14%	Postal Survey	4318	37%	Over half had made at least one attempt to quit smoking
Hussain et al [74]	1991	United Kingdom	5%	-	-	Postal Survey	1069	82%	Fewer physicians smoked when compared to nurses
Yaacob & Abdullah [75]	1991	Malaysia	18%	25%	0%	Postal and Hand Delivered	120	100%	Around half the smokers had begun before medical school
Doll et al [76]	1990	United Kingdom	-	18%	-	Postal Survey	10807	94%	A large proportion of smokers only smoked pipes and cigars
Kaetsu et al [77]	1990	Japan	32%	33%	5%	Postal Survey	3565	63%	Male physicians younger than 40 had the highest smoking rate
Jormanainen et al [78]	1990	Finland	-	10%	6%	Postal Survey	1231	76%	General practitioners had a higher smoking rate than specialists
Brink et al [79]	1990	United States	2%	-	-	Postal Survey	132	77%	Physicians smoked at similar rates when compared to dentists
Bener et al [72]	1990	Kuwait	38%	45%	16%	Postal Survey	252	84%	Over half the smokers were aged 35 to 44 years
Hensrud & Sprafka [80]	1989-90	United States	9%	10%	2%	Postal Survey	393	83%	Physicians aged 60-69 years had the highest smoking rate
Waalkens et al [81]	1989	The Netherlands	32%	37%	14%	Postal Survey	362	63%	More consultants smoked than house officers
Kawane [82-84]	1989	Japan	25%	26%	6%	Postal Survey	3640	59%	Chest physicians smoked at lower rates than physicians, generally

Dekker et al [85]	1989	Netherlands	38%	41%	24%	Postal Survey	263	82%	More general practitioners smoked than consultants
Hughes et al [86]	1989	United States	6%	-	-	Postal Survey	5426	59%	Older physicians were more likely to have ever smoked
Scott et al [87]	1988	United States	5%	5%	4%	Postal Survey	2341	86%	Physicians aged 55-64 years had the highest smoking rate
Fowler et al [88]	1987-88	United Kingdom	4%	-	-	Postal Survey	2176	75%	A further 11% of male physicians smoked pipes or cigars
Saeed [89]	1987	Saudi Arabia	34%	-	-	Hand Delivered	716	81%	Males smoked more sticks per day than female physicians
Nutbeam & Catford [90]	1987	Wales	14%	17%	0%	Postal Survey	310	60%	Almost one-quarter of female physicians were ex-smokers
Hughes et al [91]	1987	United States	4%	-	-	Postal Survey	1754	60%	Psychiatry residents had the highest smoking rate
Davies & Rajan [92]	1987	United Kingdom	3%	-	-	Postal Survey	94	72%	Fewer physicians smoked when compared to nurses
Cheng & Lam [93]	1987	Hong Kong	5%	7%	0%	Postal Survey	133	88%	Only 8% of female physicians had ever smoked tobacco
Stillman et al [94]	1987	United States	6%	-	-	Postal Survey	6050	69%	A no-smoking hospital policy helped reduce the smoking rate
Sarkar et al [95]	1986-87	India	32%	48%	3%	Interview	218	99%	Physicians aged 20-29 had the highest smoking rate
Franceschi et al [96]	1985	Italy	31%	-	-	Postal and Telephone	709	86%	Over half of the smokers reported no attempt to quit smoking
Linn et al [97]	1984	United States	4%	-	-	Postal and Telephone	211	67%	A further 2% smoked either weekly or monthly
Joossens et al [98]	1983	Belgium	32%	34%	16%	Postal Survey	2157	67%	Around half of the smokers were evaluated as being dissonant
Kaetsu et al [99]	1983	Japan	43%	45%	9%	Postal Survey	4232	84%	Male physicians younger than 40 had the highest smoking rate
Sachs [100,101]	1983	United States	12%	-	-	Conference Survey	594	27%	Smoking was higher among non-practicing specialists
Seiler [102]	1983*	Scotland	19%	-	-	Postal Survey	607	81%	Almost half of smoking doctors had spouses who also smoked
Senior [103]	1982*	Canada	19%	-	-	Hand Delivered	88	52%	Fewer physicians smoked when compared to nurses
Fortmann et al [104]	1982	United States	8%	-	-	Postal Survey	221	62%	Physicians older than 46 years had the highest smoking rate

Hay [105]	1981	New Zealand	15%	15%	13%	Census Data	4937	97%h	Fewer physicians smoked when compared to nurses
Ballal [106]	1980	Sudan	-	46%	1%	Postal and Hand Delivered	753	72%	Some respiratory symptoms were more common among smokers
Wyshak et al [107]	1979	United States	14%	-	-	Postal Survey	289	70%	Fewer physicians smoked when compared to lawyers
Wells et al [108]	1978	United States	-	15%	-	Hand Delivered	151	76%	Surgeons / obstetricians had the highest smoking rates
Dodds et al [109]	1977	Australia	21%	22%	16%	Postal and Telephone	275	80%	Physicians aged 50-59 years had the highest smoking rate
Hay [110]	1976	New Zealand	-	20%	17%	Census Data	4089	97%h	Obstetricians had the highest smoking rates of all
Aarø et al [111]	1974	Norway	-	35%	22%	Postal Survey	1138	95%	Male physicians aged 55-64 had the highest smoking rate
Rankin et al [112]	1974	Australia	14%	14%	17%	Postal Survey	1276	69%	Physicians aged 50-59 years had the highest smoking rate

[a] Including the reference number as listed in this manuscript, [b] Year in which the study was undertaken – not the year of publication (in cases where the study year was not listed, manuscripts are arranged by publication year and marked with an asterisk*), [c] Smoking rates rounded to the nearest whole number, [d] Response rates rounded to the nearest whole number (as some studies investigated multiple occupational groups, response rates may be indicative of the entire group rather than just physicians), [e] Subjects were restricted to Hispanic physicians living in the United States, [f] Subjects were restricted to Asian-Indian physicians living in the United States, [g] The survey used a convenience sample with an unspecified response rate, [h] Response rate of the entire census, [i] Subjects were restricted to African-American physicians living in the United States

Part 3

Tobacco Smoking among Nurses

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An International Review of Tobacco Smoking Research in the Nursing Profession: 1976-2006

ABSTRACT

Tobacco smoking represents a contentious issue in the nursing profession, and one that has now become an important topic in nursing research. Despite this fact, the epidemiological quality of research varies widely, and it has been difficult to accurately determine the true incidence of smoking among nurses. Given these inconsistencies, a state-of-the-art review was undertaken to identify international trends in tobacco usage among nurses, to ascertain how the epidemiological quality of research has improved over the past 30 years, and also to elucidate the directions in which nursing research has evolved. A total of 73 English-language studies which met the inclusion criteria were located and analysed. From a methodological perspective, the relative epidemiological quality of smoking research has also fluctuated over time, making it difficult to compare the results of one study to the next. Despite these caveats, tobacco smoking remains a key topic in nursing research, as well as a critically important occupational health issue for the entire nursing profession. In order to make the next generation of tobacco research data as comparable as possible, future scholars should consider devising and implementing a standardised format for conducting international tobacco smoking research within the nursing profession.

Introduction

The importance of smoking as a global threat to health cannot be underestimated. Tobacco is now the second leading cause of death worldwide, being responsible for at least five million fatalities each year. This figure is expected to rise to 10 million deaths per year in 2020, with about half of all smokers eventually being killed by their habit (World Health Organization, 2006). Nurses are on the frontlines in the war against tobacco, and many smoking patients will inevitably turn to them for smoking-related advice (Charlton et al., 1997). Tobacco control therefore, represents a critical issue for the nursing profession in the 21st century (Sarna and Bialous, 2005). As nurses are both public health role models and the largest professional group in health care (Adriaanse et al., 1991), tobacco smoking among them has long been a contentious issue. In this regard it has been previously suggested that three main problems arise when a nurse smokes. Firstly, there is the issue of the nurse's own health (Mundt et al., 1995). Secondly, there is the issue of passive exposure for those around them. And thirdly, there is the broader issue of smoking patients who may not be as well-served by the smoking nurse (Bartscherer et al., 2006).

Aside from its adverse health effects, it is this third issue that represents a critical public health concern, as nurses are widely recognised as community role models for smoking and other lifestyle factors. Furthermore, the chance of a smoker successfully quitting can be increased markedly by nurse-led tobacco control interventions (Froelicher and Thompson, 2005). Nurses who smoke on the other hand, represent a major barrier for successful tobacco-control

interventions (Froelicher and Kohlman, 2005), and it has been shown that they may be less motivated to provide cessation support for patients (McKenna et al., 2001; Slater et al., 2006). While tobacco use clearly influences a nurse's status as role model and health educator (Padula, 1992), from an occupational health perspective, smoking also exerts a major impact on the nurse's work environment (Sarna et al., 2005). For these reasons and more, it is essential that the prevalence of smoking be continually reduced, if not eliminated, within the nursing profession.

While smoke-free nurses should clearly be leading their patients by example (Halcomb, 2005), the reason why nurses actually choose to smoke remains a complex and multifaceted conundrum. Three main themes often mentioned include stress, social influences and demographic background (Rowe and Clark, 2000a). Although stress has long been proposed as a primary reason for tobacco use in the nursing profession (Rausch et al., 1987; Elkind, 1988) causal relationships between the two have still not been clearly elucidated. In a study of Scottish nurses for example, Plant et al. (1992) found no significant differences in stress levels between smokers and non-smokers. Demographic correlations on the other hand, are attractive at least partly because many nursing students appear to commence smoking prior to entering the profession (Rowe and Clark, 2000a). Personal and occupational factors may also count for something, as there are well-known differences between substance usage rates and nursing specialty (Storr et al., 2000). Whatever the reason, it is imperative that nurses should not be smoking tobacco at all, and those who do so should be encouraged to quit. Helping nurses to quit smoking themselves is not a

straightforward process however (Chalmers et al, 2001), rather, it is one that can only be achieved when the complex reasons as to why nurses smoke are more clearly elucidated.

As a result of this ongoing conundrum, tobacco smoking has emerged as an increasingly important topic for nursing research (Sarna and Lillington, 2002), and one which has in turn, resulted in an increasingly large number of studies being published. Nevertheless, it has previously been noted that the quality of smoking research varies widely, and some inconsistent results have often been revealed (Rowe and Clark, 2000b). As such it has been difficult to accurately determine the true incidence of smoking within the nursing profession. The aim of our current review therefore, was to not only identify international trends in tobacco usage and smoking habits among nurses, but to also to analyse the quality of research which has been undertaken in this regard. We were particularly interested in how the epidemiological quality of smoking research has progressed over the past 30 years from the perspective of sample sizes and response rates, and also the directions in which nursing research has evolved. Providing a clearer picture of how well smoking research has been undertaken in this regard offers the additional benefit of promoting what Mulhall (2000) referred to as 'a more epidemiologically informed nursing profession' (p.65).

Methods

We conducted a state-of-the-art review of all journal papers on tobacco smoking research which have been published in international journals over the past 30

years. As English has become the international language of scientific research and basically all literature search engines now include it, our review focused on manuscripts written in this particular format. The review began with a comprehensive literature search of the United States National Library of Medicine (Pubmed), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the British Nursing Index and the American Psychological Association (PsycINFO) databases, using relevant MeSH (Medical Subject Headings) terms such as: 'nurse', 'smoking' and 'tobacco'. After identifying some initial manuscripts, the search was repeated using keyword variations such as 'smoke' and 'nursing'. Although a surprisingly large number of smoking-related studies were found using these methods, it has been previously noted that only a fraction of nursing periodicals are currently included on medical research databases.

Melby (2005) for example, estimates that less than one percent of the nursing journals in existence today are actually listed in the Institute of Scientific Information (ISI) Journal Citation Reports. Any literature review which locates its material through search engines alone therefore, could be expected to miss some important articles. Another methodological issue when conducting systematic reviews of previous research articles is the fact that biomedical research itself tends to have a general bias against countries with lower economic rankings (Rahman and Fukui, 2003). For these reasons, we considered it necessary to carefully check the reference lists of all manuscripts found using the initial search engines, in order to locate as many appropriate publications as possible.

Each article located during the literature search was entered into a spreadsheet program for ease of searching and stratification. Studies were first arranged by the country in which the research had been conducted and then, in descending order according to the year in which the research had been published. Smoking prevalence rates were listed as an overall smoking prevalence rate and prevalence rates by gender (where available), all of which were expressed in percent values and rounded to the nearest whole number for standardisation purposes. The specialisation of nurses who were surveyed was stratified as follows: All = All types of nurses, OH = Occupational health nurses, RSP = Respiratory care nurses, OBG = Obstetrics and gynaecology nurses, PSY = Psychiatric nurses, CD = Cardiac care nurses, TUT = Nurse tutors, ANE = Nurse anaesthetists, SCH = School nurses, HHC = Home health care nurses, ONC = Oncology nurses, ED = Emergency department nurses and CC = Critical care nurses.

The total number of nurses surveyed was included as well as the response rate for each survey, again expressed as percent values and rounded for standardisation purposes. Where the study only recruited nurses, the response rate clearly refers to this group. However, a certain proportion of investigations were actually conducted across a range of job descriptions, some of which listed specific response rates for each group, while others only gave a response rate for the entire group. As such, we used the nurse-only response rate wherever it was available, and where it was not, we listed the total number of nurses in the study and the overall response rate. The survey methodology of each study was stratified into categories depending on whether the authors had

used a postal survey, hand delivered surveys, a survey distributed by the internal mail system, census data or a personal interview. In one study multiple survey methods had been used, and this was also indicated on the table. The location from where their nurses had been recruited was also stratified, depending on whether the nurses were working in single hospital, multiple hospitals, whether their names had been drawn from nurse association or state nurse registration lists, whether it was a national survey, they were conference attendees, military nurses, health department employees or nursing journal readers. For any category where the appropriate information was simply not listed, the term 'n/s' (Not Specified) was entered into the spreadsheet.

Basic statistical analysis was performed to help assess the progression of trends in tobacco-related nursing research over time. For these calculations, the year of publication was grouped into three groups as follows: 1976-1985, 1986-1995 and 1996-2006. Average values were calculated for smoking prevalence rates, sample sizes and survey response rates, as we were particularly interested in how these values had evolved over time. From an epidemiological perspective, we also considered how well tobacco research has been conducted among nurses, what are the main results being obtained, and how has the research quality of research studies improved.

Results and Discussion

A total of 73 English-language studies which met the inclusion criteria were located and analysed during this study. As roughly two-thirds had been published in the past 10 years, it would appear that the available literature on

nurse's tobacco smoking is rapidly increasing. One initial finding was the relatively large number of studies which have actually investigated tobacco smoking among nurses from a variety of countries. In this regard, we located research emanating from Australia, the Balkans, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, New Zealand, South Africa, Taiwan, the United Kingdom and the United States. As expected, there was a tendency for most investigations to have been conducted in developed nations, which is consistent with the observations of Rahman and Fukui (2003) and one which represents an ongoing limitation of epidemiological research in this field. Roughly one-third of the manuscripts we located had originated from the United States, with a further one-fifth coming from the United Kingdom. Interestingly, a surprisingly large number of research projects had been conducted in Japan, representing almost ten percent of the total. With the recent emergence of newly developing countries in the Asian and European region, we were also pleased to find English-language studies that had been undertaken among nurses in the Balkans and China.

The most common epidemiological tool for determining an individual's smoking status appears to be the self-reporting questionnaire. While biochemical measures of carbon monoxide and cotinine are being increasingly used for this purpose, the validity and accuracy of self-reported smoking surveys has been previously demonstrated in a variety of studies (Patrick et al., 1994; Vartiainen et al., 2002). Questionnaire surveys themselves represent a cost-effective, convenient, well-received and therefore useful methodology for researching large and dispersed professional groups, such as nurses. For these reasons,

self-reporting questionnaire surveys were found to be the sole methodology for determining smoking prevalence rates among the studies we located. Despite this fact, one confounding factor noticed early on was a general lack of standardisation regarding the definition of tobacco 'smoker'. This issue may have arisen due to the inherent difficulties in assessing tobacco usage patterns over time, and the fact that most tobacco-related research simply described the point-prevalence of smoking within a certain group of nurses. Indeed, this appears to be a methodological issue across a number of studies we found, and one which could not be definitively resolved. While many authors referred to their subjects as being either 'smokers' or 'current smokers', some researchers used other labels such as 'regular smokers' or 'daily smokers'. In any case, the predominance of self-reporting smoking questionnaires suggests that these terms were of roughly equivalent meaning to the nurses they surveyed. As such, for the purposes of a comparative review across as wide a range of articles and countries as possible, we accepted that any of these four terms would have been equivalent in meaning.

A major issue to consider from an epidemiological perspective is that of absolute sample size. In this regard it is important to establish how many nurses have actually been participating in tobacco-related research during the past 30 years. The largest study conducted thus far which included smoking data appears to have been published by Myers and colleagues in 1987 (Myers et al., 1987). In their investigation, Myers et al. analysed the data of 91 651 married, female nurses from the United States, who had been recruited in the Nurses' Health Study. Follow-up data from the Nurses' Health Study was also used in

the second largest investigation, published by Bain and colleagues in 2004 (Bain et al., 2004). In their article Bain et al. (2004) was able to analyse the results of data from 56 458 nurses in the United States. The third largest overall sample size that had been captured was published by Hay in 1984 (Hay, 1984). In this study, Hay extracted the data from 30 720 nurses during the New Zealand national census, one of the few countries in the world which actually includes smoking-related information as part of their census questions. Aside from research projects which used part of a larger national data set as their primary data source, there have also been smaller, but equally impressive investigations undertaken during this time. At least three authors have published papers with nurse sample sizes over 2000. The largest of these was described by Harrison in 1991, where 4776 registered nurses in the Canadian Nurses Association were sampled. In 1998 Trinkoff and Storr published an article describing the substance use patterns (including tobacco) among 4438 registered nurses in the United States. In a three phase study of German health care workers, John and Hanke (2003) recruited 3981 nurses in the late 1990s.

While our review suggests that the absolute number of subjects which some researchers have been recruiting may be large, not all studies were equally impressive. Between 1976 and 2006 for example, at least eight researchers published studies where less than 100 nurses had been sampled. In 1992 for example, Blakey and Seaton published the results of their smoking survey among 649 student nurses and 51 nurse tutors. Steptoe and colleagues (1999) conducted a questionnaire survey of general practice in the United Kingdom, 58 of whom were nurses. Brown et al. (2006) also published a survey of 58

Hawaiian nurses, which was part of a large investigation of job strain among nurses and teachers. From a statistical perspective, the distribution of absolute sample sizes was heavily skewed by the large national studies previously mentioned. While the mean sample size of nurse smoking surveys conducted in the past 30 years was around 4000, this does not give a realistic indication of what sample sizes were generally being used by nurse researchers. As such, the median value (around 700) represents a more realistic estimation of the 'average' number of nurses being recruited. Half of all values lay between 300 and 1300, suggesting that a large proportion of studies used sample sizes within this range.

Although large sample sizes will no doubt create a favourable impression in the academic world, the practical value of any epidemiological investigation should be measured by how accurately its sample represents the overall population. From a statistical perspective, the response rate of studies included in our current review ranged from 5% to 100%, with a mean value of just over 70%. While the data was skewed towards 100% due to the ten manuscripts with rates over 90%, the median value was around 75% with half of all values lying between 59% and 87%. As the issue of survey response is critical in all research activities, it important to recognise the wide range of response rates identified during the current review. The highest of these was published by Steptoe and colleagues in 1999 during their survey of 19 group practices in the United Kingdom. While a perfect response rate (100%) was stated, this may reflect the overall small number of nurses actually surveyed by the authors (N = 58). Nevertheless, at least three other investigations have also obtained very

high response rates of 98% when targeting nurses in China (Smith et al., 2005), Taiwan (Yang et al., 2001) and the United States (Alexander and Beck, 1990). Similarly, Petch-Levine et al. (2003) captured 97% of their sample in the United States, while Sekijima et al. (2005) obtained a 96% response rate during a nurse survey in Japan. Four additional authors also published studies where over 90% of their nurse sample was successfully sampled (Hope et al., 1998; Ohida et al., 1999; Borrelli et al., 2001; Willaing et al., 2003).

On the other hand, at least eight nurse smoking surveys published since 1976 had obtained responses from less than half the invited participants. That is their response rates were all reported to be below 50% (Stillman et al., 1994; Blazer and Mansfield, 1995; Alderman, 1997; Callaghan et al., 1997; Sarna et al., 2000; UNITE Study Group, 2002; Dickens et al., 2004; Stubbs et al., 2004). The lowest response rate obtained during a nurse survey appears to have been published by Alderman in 1997. In this study, a national nursing journal from the United Kingdom inserted lifestyle-related questionnaires into 20 000 subscription copies of their journal. At the time of publication, 1839 surveys had apparently been returned (9.2% response rate) and the data from 1000 surveys analysed (5.0% of the total number originally sent out). From these crude figures, it can be suggested that the analysed data could have, at best, reflected only one-in-twenty nurses who were originally targeted. While the small response rate was acknowledged in an editorial (Gray, 1997), exactly how well their figures represent the overall nurse population or even the readership of the journal, remains unknown. Similarly, in 1995 Blazer and Mansfield published the results of a study which targeted nurses, clerical workers and blue collar

workers in the United States. From 5000 nurses who were originally sent a substance use questionnaire, only 952 replied (19.0%). As the authors then excluded 32 responses from male nurses, the final response rate could be calculated as being 18.5%. From these analyses, it can be seen that the response rate, not just the overall sample size, of a tobacco smoking survey is critically important for determining how representative the data is.

Low response rates are particularly important in surveys where the measured outcome may be socially undesirable, as participants may be reluctant or embarrassed to admit certain things on a survey, or even return their survey at all. Nurses who smoke tobacco for example, may feel guilty about their habit (Booth and Faulkner, 1986). As such, smoking among health care workers represents an area where responder bias can certainly occur, and one that was recognised as a methodological limitation of survey-based research early on. In 1970 for example, Burgess and Tierney surveyed smoking habits among American physicians and found that although 90% of all non-smokers responded to their initial mailed survey, only 77% of smokers had done so. Later analysis of the smoking prevalence among survey respondents when compared to non-respondents also revealed wide discrepancies (with smoking rates of 22.6% among respondents versus 45.5% among non-respondents). In a postal survey of US nurses, Morra and Knobf (1983) revealed that the smoking rate among those who responded to their initial mailing (25.5%) was lower than among those who responded to a second follow-up mailing (30.4%). A more recent survey in Japan also found a similar trend. In their survey of Japanese physicians, Ohida et al. (2001) revealed that the prevalence of

smoking among participants who responded to the second, third and fourth mailings was approximately 1.5 times higher than for those who had replied to the initial mailing (Ohida et al., 2001). These results tend to suggest that health care professionals who consume tobacco may be reluctant to fill out and return smoking-related questionnaires. It is imperative therefore, that nursing researchers carefully consider these issues when designing research investigations.

From the publications located during our international review, a number of important issues can be established with regard to smoking prevalence rates. Firstly, the overall prevalence of smoking has been shown to vary widely, both from country to country and from year to year. Some previous studies for example have shown that less than five percent of nurses are current smokers in Asian regions such as China (Smith et al., 2005), Hong Kong (Johnston et al., 2005) and Taiwan (Yang et al., 2001). This may reflect the overall high proportion of Asian nurses that are female (Arthur et al., 1999), combined with a general cultural reluctance for women to smoke in certain parts of the world (Mackay, 1996; Ernster et al., 2000). Even so, at least one study from the United States revealed that less than one-in-twenty nurses smoked tobacco (Petch-Levine et al., 2003). Similarly encouraging prevalence rates below 10% were also shown to exist among nurses in the United Kingdom (Steptoe et al., 1999) and the United States (Reeve et al., 1996; Sarna et al., 2000; Yankie et al., 2006). High contemporary smoking rates on the other hand, have been revealed in Greece (Beletsioti-Stika and Scriven, 2006), Israel (Kaplan et al.,

2002) Italy (Nardini et al., 1998; Zanetti et al., 1998) and South Africa (Retief et al., 2003).

Aside from their relative epidemiological value at the time, multiple studies conducted in the same country over time, may give some insight as to how the smoking epidemic is progressing in that particular region. In this regard, tobacco consumption among Australian nurses apparently declined from 53% in 1976 (Kirkby et al., 1976) to 21% in 1999 (Hughes and Rissel, 1999), while in Canada the rate appeared to fall from 32% in 1982 (Senior, 1982) to 12% in the year 2000 (Chalmers et al., 2000). In the United States, where a variety of smoking surveys have been historically performed among nurses, early research suggested the smoking rate might be around 26% in the early 1980s (Morra and Knobf, 1983), a rate which declined to 18% (Nelson et al., 1994) and then to 10% (Brown et al., 2006). Not all tobacco research conducted over time has revealed such clear trends in smoking reduction however. In Japan for example, the national smoking rate among female nurses was initially reported to be 19% in 1999 (Ohida et al., 1999). In 2002 however, Kitajima et al. (2002) found that 34% of their female nurses were smoking, whereas Smith et al. (2006) reported that the rate was only 11% among their group.

On the other side of the world in 1984 (Spencer, 1984) reported that 40% of their UK nurses were current tobacco smokers. This rate had apparently declined to 26% in 1992 (Blakey and Seaton, 1992) and 20% in 1993 (Hussain et al., 1993). Two UK publications from 2004 however (Dickens et al., 2004; Stubbs et al., 2004), reported smoking rates between 17% and 26%. A recent

publication by Bloor et al. (2006) on the other hand, suggested a very high smoking rate of 35% among psychiatric nurses. From these results it can be suggested that while smoking rates among nurses may be declining in some regions over time, geographical differences may offer an important confounding factor if large numbers of nurses tend to smoke in certain regions. Furthermore, the different demographic background from which nurses in certain hospitals are being drawn may further complicate the issue of exactly how many nurses smoke in a particular country at a particular time. Multiple surveys conducted in a variety of regions will therefore be needed to more accurately answer these types of questions in future. To date, the only countries that have looked at smoking rates among large, comprehensive, multidisciplinary and nationally-representative samples of the nursing profession appear to be Japan (Ohida et al., 1999), New Zealand (Hay, 1980; Hay, 1984; Hay, 1998) and the United States (Myers et al., 1987; Bain et al., 2004). Further research of this nature should now be conducted in other countries.

Another major confounder noticed during the current review was the wide discrepancy in smoking prevalence rates between male and female nurses. While only a small proportion of manuscripts had divided their results by gender, in some cases where it had been done these differences in prevalence rates were large. In one Chinese study for example, the overall smoking rate was 3% but among male nurses it was 52% (Smith et al., 2005) and in Japan 75% of male nurses reported smoking, whereas only 15% of females did (Ohida et al., 2000). Slightly higher smoking rates among male nurses were documented in Australia (56% versus 52%) (Kirkby et al., 1976), Japan (19% versus 11%)

(Smith et al., 2006), New Zealand (27% versus 18%) (Hay, 1998) and the United Kingdom (17% versus 7%) (UNITE Study Group, 2002) (47% versus 39%) (Plant et al., 1991). At least two studies on the other hand, found that more female nurses smoked when compared to their male counterparts. In one Italian study for example, the smoking rate was shown to be 42% among female nurses and 40% among males (Zanetti et al., 1998), while in the United States, Bain et al. (2004) reported that 38% of female nurses smoked but only 19% of their male counterparts did. While the results of gender comparisons suggest that a nurse's smoking prevalence rate may vary in certain countries by gender, the direction and magnitude of these differences have not been shown to be uniform, and they are far from being clear-cut at the present time. Further nursing research will need to focus on exactly why male and female nurses choose to smoke, particularly whether there are any gender-specific reasons between the two groups.

Aside from gender differences, our review also revealed certain differences in tobacco smoking rates between the nursing specialities. A large review on this particular topic conducted by Storr et al. (2000) suggested that smoking may be more common among nurses working in the fields of psychiatry, administration, emergency, medical, critical care and gerontology. The same authors also suggested that tobacco use is probably less common among midwives or nurses working in paediatrics. In an attempt to quantify these differences, Trinkoff and Storr (1998) investigated substance use among a multidisciplinary group of US nurses, finding that psychiatric nurses had not only the highest smoking prevalence rate of all specialities, but that they were also 2.4 times

more likely to smoke tobacco than their counterparts. In our current review, only 16 studies had looked at smoking rates within an individual sub-speciality of the nursing profession. Of these 16, only psychiatric and oncology nurses had been the target of multiple studies. In the first instance, three separate surveys of tobacco use among staff in single psychiatric hospitals were conducted in the UK by Bloor et al. (2006), Dickens et al. (2004) and Stubbs et al. (2004). These authors found a smoking prevalence rate between 17% and 35%. It is worth noting that Bloor et al's (2006) 35% smoking prevalence was the highest rate documented among contemporary nurses in the United Kingdom. At least two authors have also investigated tobacco use among oncology nurses in the United States (Sarna et al., 2000; Reeve et al., 1996). Both documented a prevalence rate of 7%, which was one of the lowest contemporary rates seen in the American region. Although such results might suggest that psychiatric nurses tend to smoke more and oncology nurses, less, it is difficult to ascertain conclusively to what extent their samples are comparable. Given this conundrum, more national smoking research will need to be undertaken within the nursing profession which specifically investigates tobacco consumption habits by speciality.

From an epidemiological perspective the prevalence of smoking among nurses also appears to have varied over time. While the average prevalence of smoking among nurses during our review was around 20%, this value appears to be on the decline. Among manuscripts published in the first 10 years for example (i.e. 1976-1985), the average smoking rate was around 38% overall, with approximately 48% of male nurses and 40% of female nurses being

smokers at that time. By 1986-1995, the overall smoking rate had declined to 21%, and then to 20% between the years 1996-2006. This decline was slightly different for males (from 47% to 36%) than for females (25% to 21%), although the prevalence rate for both groups fell considerably. Average smoking rates by country could not be reliably calculated, simply due to the small number of studies conducted in each country (often only a single study), or the large lag between investigations undertaken in the same countries. Nevertheless, the overall prevalence of smoking among nurses appears to be on the decline as we enter the new millennium, contrary to an earlier review suggesting that many nurses smoked in the mid to late 20th century (Adriaanse et al., 1991). Furthermore, a definite progression and indeed, a major improvement of survey response rates were also evident over time. Studies conducted in the first ten years of this review for example, averaged only a 54% response rate, whereas the average response rate had risen to 70% among surveys conducted between 1996 and 2006. From our analyses it can be demonstrated that the overall smoking rate among nurses is steadily declining in recent years, while the response rate of surveys that investigate these issues has steadily increased. The quality of research on tobacco smoking within the nursing profession therefore, clearly appears to be improving in recent years.

As with any international review of tobacco smoking, there are certain strengths and limitations of the current study which need to be considered. Firstly there is the fact that tobacco smoking represents a popular topic in nursing research, and as such, a very large number of manuscripts have simply been published in this field. Not all of them are of equal relevance and quality however, so in order

to locate the most important findings we specifically limited our review to English-language manuscripts published in the previous 30 years. While this still resulted in over 70 papers being located, there is always the possibility of some important findings being missed. Such studies for example, may not have been archived on the search engines we used, nor cited in the reference lists that we subsequently consulted. Furthermore, any manuscripts that were not published in English language were automatically excluded. As previously explained in the Methods section, for practical reasons we chose to focus our current review on English-language papers because it represents the international language of research and the vast majority of important research findings are now being published in this format. As such, the limitation of non-English exclusion criteria is not as significant as it may first seem. On the other hand, if we had widened the language criteria, it would have been very difficult to decide exactly what language becomes the cut off point. That is, what non-English languages should and should not have been included. To avoid such dilemmas, English was chosen as the only acceptable format.

Of all the papers analyzed during our review, roughly two-thirds had been published in the past 10 years, and as such it would appear that the literature on nurse-related tobacco smoking research is rapidly increasing. Nevertheless, it is difficult to confirm whether this increase actually indicates that more research is being conducted, or simply that a greater proportion of research is now being listed on search engines, such as those we used for the current review. Rahman and Fukui (2003) also raised the possibility of bias in biomedical research, and the fact that countries with lower socioeconomic

rankings tend to publish less research in international journals. As with the aforementioned language issues, this particular problem is very difficult to address in a systematic literature review. Aside from debates on exactly what research articles could and should be included in our review, there is also a deeper issue of the structural limitations inherent in quantitative study design that all the studies used. In this regard, it has previously been mentioned that quantitative investigations will always incur relative strengths and weaknesses (Walker, 2005). Nevertheless, quantitative research can certainly make a valuable contribution to the worldwide body of knowledge (Walker, 2005) and there are many designs that can answer important questions for nursing professionals (Seers and Crichton, 2001). Smoking is one such area where significant information can be ascertained from even the most basic observational research, providing the data is adequately representative. In this regard, our current review has now made important inroads in developing what Mulhall (2000) termed 'a more epidemiologically informed nursing profession' (p.65).

When considering the issue of tobacco smoking among nurses, it is important to recognise future directions for research in this field. While our review suggests that too many nurses still smoke tobacco, it is important to view the results from a wider perspective of nurses' health. Almost 15 years ago, Haughey et al. (1992) suggested the need to develop strategies for meeting the health promotion needs of nurses. Aside from encouraging young nurses not to smoke, future health policies should also aim to strengthen a nurse's resolve to quit smoking (Strobl and Latter, 1998). Nurses know well the dangers that tobacco

use poses them, and at least twenty years ago it was noted that many nurses who do smoke, certainly feel guilty about their habit (Booth and Faulkner, 1986). As such, the prevention of smoking and the promotion of tobacco cessation activities remains an important goal in both nursing practice and nursing research. Despite this fact, relatively few researchers have undertaken smoking intervention studies among nurses, and relatively few that have been undertaken could be described as being totally successful.

In Northern Ireland for example, Rowe and Clark (1999) conducted a one-year smoking intervention among nurses, with a program consisting of individualized counselling based on the specific needs of each nurse. By the follow-up period one year later, 23% of the smoking nurses had apparently quit. Despite these seemingly positive findings, the relative value of the study should be treated with caution due to the recruitment methods used. In Rowe and Clark's study (1999) the participants were initially required to have 'expressed a desire to give up smoking' (p. 303) and were then assigned to either the intervention program or comparison group 'based on their preferences' (p. 303). From this description, it can be assumed that nurses who preferred interventions were always assigned to the intervention group. As such, the intrinsic value of the intervention program itself cannot be reliably determined, regardless of how many nurses actually quit smoking.

Aside from intervention studies, the individual smoker's attitudes and intentions to quit at all have also been shown to be important. In a previous American study for example, Brown and Kiss (1987) held a competition to help nurses in

their hospital to quit smoking. At the end of the two-week period however, no nurses even called or came to the quit smoking program. While Brown and Kiss (1987) subsequently referred to their trial as a 'failed experiment' (p. 227), they were able to identify some potential reasons as to why it may have been so. Some head nurses for example, had surmised that any staff who wanted to use the quit smoking program would have already done so, while further harassment of the remaining hard-core smokers was simply inappropriate (p. 229). It is this potentially 'unreachable' group of dedicated smokers that would seem to be a key area in need of attention, with regard to future smoking and tobacco control research within the nursing profession.

From a broader perspective, it is also important to consider whether the issue of tobacco smoking in nursing should be interpreted as a simple problem in itself, or as Elkind (1980) termed it, 'a signpost to more fundamental issues within nursing' (p. 267). Even if the results from smoking interventions previously conducted among nurses appear to be disappointing, it is important to remember that the value of antismoking interventions themselves should never be underestimated. Preventing nurses commencing smoking as well as helping those who already smoke to quit represents a critical issue for future nursing research. In meeting these needs, Rowe and Clark (1999) have previously found that health promotion coordinators and peer support groups may be useful. Prior to graduation Hope et al. (1998) also suggested that health promotion skills could be integrated into contemporary nurse education. According to Feldman (1984) it would be ideal if more information on the pharmacology and epidemiology of smoking could be incorporated into the

undergraduate, postgraduate and continuing education curriculum. On the bright side, tobacco smoking is now recognised as a critical issue in the nursing profession (Sarna and Bialous, 2005), with a nationwide initiative known as 'Tobacco Free Nurses' being launched in the United States (Tobacco Free Nurses Website, 2006) and the Royal College of Nursing in the United Kingdom also becoming proactive in the anti-smoking movement (Royal College of Nursing Website, 2006). Although targeted efforts will be needed to overcome the barriers for tobacco smoking cessation in nursing (Sarna et al., 2001), there are no magic bullets. Despite the absence of a single and universally-effective smoking intervention, all tobacco control activities mentioned in this review will have something to offer and as such, all may be useful to reduce further tobacco consumption in the nursing profession in future years. From an epidemiological perspective the integration of qualitative and quantitative research methods as suggested by Kinn and Curzio (2005) may also signify the way forward for future generations of tobacco research in the nursing profession.

Conclusion

Overall, this review suggests that while nurses' tobacco usage is decreasing in many countries during recent years, the international trend is far from uniform, and some developed nations still appear to have high smoking rates among their nursing staff. The prevalence and distribution of tobacco use has been shown to vary widely depending on the time period when the study was undertaken and also the nursing discipline which was sampled. Aside from tobacco smoking rates, our review also suggests that the relative epidemiological quality of research investigations has fluctuated over time,

making it difficult to directly compare the results from one individual study to another. Despite these caveats, tobacco smoking remains a key topic in nursing research as well as a critically important occupational health issue for the entire nursing profession. On the bright side, the quality of nursing research in this field is certainly improving. In order to make the next generation of tobacco research data as comparable as possible, future scholars should consider devising and implementing a standardised international nurse smoking survey in this regard.

References

Adriaanse, H., Van Reek, J., Zandbelt, L., Evers, G. (1991) Nurses' smoking worldwide. A review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959-1988. *International Journal of Nursing Studies* 28:4, 361-375.

Alderman, C. (1997) Here's looking at you. *Nursing Standard* 11:16, 23-27.

Alexander, L.L., Beck, K. (1990) The smoking behaviour of military nurses: The relationship to job stress, job satisfaction and social support. *Journal of Advanced Nursing* 15:7, 843-849.

Arthur, D., Pang, S., Wong, T., Alexander, M.F., Drury, J., Eastwood, H., Johansson, I., Jooste, K., Naude, M., Noh, C.H., O'Brien, A., Sohng, K.Y., Stevenson, G.R., Sy-Sinda, M.T., Thorne, S., van der Wal, D., Xiao, S. (1999) Caring attributes, professional self concept and technological influences in a sample of Registered Nurses in eleven countries.

International Journal of Nursing Studies 36:5, 387-396.

Bain, C., Feskanich, D., Speizer, F.E., Thun, M., Hertzmark, E., Rosner, B.A., Colditz, G.A. (2004) Lung cancer rates in men and women with comparable histories of smoking. *Journal of the National Cancer Institute* 96:11, 826-834.

Barrett, T.W., Norton, V.C., Busam, M., Boyd, J., Maron, D.J., Slovis, C.M. (2000) Self-reported cardiac risk factors in emergency department nurses and paramedics. *Prehospital and Disaster Medicine* 15:2, 14-17.

Bartscherer, D.J., Reichert, V.C., Folan, P., DeGaetano, C., Jacobsen, D.R., Miceli, L., Kohn, N., Talwar, A. (2006) Tobacco and the health care industry. *Clinics in Occupational and Environmental Medicine* 5:1, 55-71.

Becker, D.M., Myers, A.H., Sacci, M., Weida, S., Swank, R., Levine, D.M., Pearson, T.A. (1986) Smoking behavior and attitudes toward smoking among hospital nurses. *American Journal of Public Health* 76:12, 1449-1451.

Beletsioti-Stika, P., Scriven, A. (2006) Smoking among Greek nurses and their readiness to quit. *International Nursing Review* 53:2, 150-156.

Bialous, S.A., Sarna, L., Wewers, M.E., Froelicher, E.S., Danao, L. (2004) Nurses' perspectives of smoking initiation, addiction, and cessation. *Nursing Research* 53:6, 387-395.

Blakey, R., Seaton, A. (1992) Smoking attitudes amongst nursing tutors and their students. *Health Bulletin (Edinburgh)* 50:6, 417-421.

Blazer, L.K., Mansfield, P.K. (1995) A comparison of substance use rates among female nurses, clerical workers and blue-collar workers. *Journal of Advanced Nursing* 21:2, 305-313.

Bloor, R.N., Meeson, L., Crome, I.B. (2006) The effects of a non-smoking policy on nursing staff smoking behaviour and attitudes in a psychiatric hospital. *Journal of Psychiatric and Mental Health Nursing* 13:2, 188-196.

Booth, K., Faulkner, A. (1986) Links between nurses and cigarette smoking? *Nurse Education Today* 6:4, 176-182.

Borrelli, B., Hecht, J.P., Papandonatos, G.D., Emmons, K.M., Tatewosian, L.R., Abrams, D.B. (2001) Smoking-cessation counseling in the home. Attitudes, beliefs, and behaviors of home healthcare nurses. *American Journal of Preventive Medicine* 21:4, 272-277.

Braun, B.L., Fowles, J.B., Solberg, L.I., Kind, E.A., Lando, H., Pine, D. (2004) Smoking-related attitudes and clinical practices of medical personnel in Minnesota. *American Journal of Preventive Medicine* 27:4, 316-322.

Brown, D.E., James, G.D., Mills, P.S. (2006) Occupational differences in job strain and physiological stress: Female nurses and school teachers in Hawaii. *Psychosomatic Medicine* 68:4, 524-530.

Brown, M.H., Kiss, M.E. (1987) Evaluation of competition as a method to recruit nurses into an employee self-help quit-smoking program. A failed experiment. *Cancer Nursing* 10:4, 227-230.

Burgess, A.M., Tierney, J.T. (1970) Bias due to nonresponse in a survey of Rhode Island physicians' smoking habits - 1968. *New England Journal of Medicine* 282:16, 908.

Callaghan, P. (1995) A preliminary survey of nurses' health-related behaviours. *International Journal of Nursing Studies* 32:1, 1-15.

Callaghan, P., Fun, M.K., Yee, F.C. (1997) Hong Kong nurses' health-related behaviours: Implications for nurses' role in health promotion. *Journal of Advanced Nursing* 25:6, 1276-1282.

Chalmers, K., Bramadat, I.J., Cantin, B., Shuttleworth, E., Scott-Findlay, S. (2000) Smoking characteristics of Manitoba nurses. *Canadian Nurse* 96:1, 313-314.

Chalmers, K., Bramadat, I.J., Cantin, B., Murnaghan, D., Shuttleworth, E., Scott-Findlay, S., Tataryn, D. (2001) A smoking reduction and cessation program with registered nurses: Findings and implications for community health nursing. *Journal of Community Health Nursing* 18:2, 115-134.

Charlton, A., While, D., Mochizuki, Y. (1997) A survey into the smoking habits of nursing students. *Nursing Times* 93:39, 58-60.

Collins, R.L., Gollnisch, G., Morsheimer, E.T. (1999) Substance use among a regional sample of female nurses. *Drug and Alcohol Dependence* 55:1-2, 145-155.

Cooreman, J., Pretet, S., Levallois, M., Marsac, J., Perdrizet, S. (1989) Smoking among hospital nurses. *American Journal of Public Health* 79:6, 782.

Davies, P.D., Rajan, K. (1989) Attitudes to smoking and smoking habit among the staff of a hospital. *Thorax* 44:5, 378-381.

Dickens, G.L., Stubbs, J.H., Haw, C.M. (2004) Smoking and mental health nurses: a survey of clinical staff in a psychiatric hospital. *Journal of Psychiatric and Mental Health Nursing* 11:4, 445-451.

Dore, K., Hoey, J. (1988) Smoking practices, knowledge and attitudes regarding smoking of university hospital nurses. *Canadian Journal of Public Health* 79:3, 170-174.

Elkind, A.K. (1980) Nurses' smoking behaviour: Review and implications. *International Journal of Nursing Studies* 17:4, 261-269.

Elkind, A.K. (1988) Do nurses smoke because of stress? *Journal of Advanced Nursing* 13:6, 733-745.

Ernster, V., Kaufman, N., Nichter, M., Samet, J., Yoon, S.Y. (2000) Women and tobacco: Moving from policy to action. *Bulletin of the World Health Organization* 78:7, 891-901.

Faehnrich, J., Gerlach, R.W. (1989) Smoking history and attitudes of nurses at a large tertiary care facility. *Journal of Cancer Education* 4:1, 55-60.

Feldman, R. (1984) Smoking and the psych nurse. *Journal of Psychosocial Nursing and Mental Health Services* 22:8, 13-16.

Feldman, B.M., Richard, E. (1986) Prevalence of nurse smokers and variables identified with successful and unsuccessful smoking cessation. *Research in Nursing and Health* 9:2, 131-138.

Froelicher, E.S., Kohlman, V.C. (2005) Tobacco free nurses. The facts on nurses and smoking. *Journal of Cardiopulmonary Rehabilitation* 25:4, 198-199.

Froelicher, E.S., Thompson, D.R. (2005) The facts on nurses and smoking. *European Journal of Cardiovascular Nursing* 4:1, 1-2.

Gray, J. (1997) Number of nurses who smoke 'extremely low'. Nursing Standard 11:16, 5.

Halcomb, K.A. (2005) Smoke-free nurses: leading by example. *American Association of Occupational Health Nurses Journal* 53:5, 209-212.

Harrison, M.B. (1991) Assessment of the smoking prevention and cessation needs of Canadian student nurses & registered nurses. *Canadian Journal of Cardiovascular Nursing* 2:1, 22.

Haughey, B.P., Mathewson, M.K., Dittmar, S.S., Wu, Y.W. (1989) Smoking practices of critical care nurses. *Heart and Lung* 18:1, 29-35.

Haughey, B.P., Kuhn, M.A., Dittmar, S.S., Wu, Y.W. (1992) Health care of critical care nurses: Health practices of critical care nurses. *Heart and Lung* 21:3, 203-208.

Hay, D.R. (1980) The smoking habits of nurses in New Zealand: Results from the 1976 population census. *New Zealand Medical Journal* 92:672, 391-393.

Hay, D.R. (1984) Intercensal trends in cigarette smoking by New Zealand doctors and nurses. *New Zealand Medical Journal* 97:574, 253-255.

Hay, D.R. (1998) Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. *New Zealand Medical Journal* 111:1062, 102-104.

Heloma, A., Reijula, K., Tikkanen, J., Nykyri, E. (1998) The attitudes of occupational health personnel to smoking at work. *American Journal of Industrial Medicine* 34:1, 73-78.

Hodgetts, G., Broers, T., Godwin, M. (2004) Smoking behaviour, knowledge and attitudes among Family Medicine physicians and nurses in Bosnia and Herzegovina. *BMC Family Practice* June 11:5, 12.

Hope, A. Kelleher, C.C., O'Connor M. (1998) Lifestyle practices and the health promoting environment of hospital nurses. *Journal of Advanced Nursing* 28:2, 438-447.

Hughes, A.M., Rissel, C. (1999) Smoking: Rates and attitudes among nursing staff in central Sydney. *International Journal of Nursing Practice* 5:3, 147-154.

Hussain, S.F., Tjeder-Burton, S., Campbell, I.A., Davies, P.D.O. (1993) Attitudes to smoking and smoking habits among hospital staff. *Thorax* 48:2, 174-175.

John, U., Hanke, M. (2003) Tobacco-smoking prevalence among physicians and nurses in countries with different tobacco-control activities. *European Journal of Cancer Prevention* 12:3, 235-237.

Johnston, J.M., Chan, S.S., Chan, S.K., Lam, T.H., Chi, I., Leung, G.M. (2005) Training nurses and social workers in smoking cessation counseling: A population needs assessment in Hong Kong. *Preventive Medicine* 40:4, 389-406.

Jones, T.E., Crocker, H., Ruffin, R.E. (1998) Smoking habits and cessation programme in an Australian teaching hospital. *Australian and New Zealand Journal of Medicine* 28:4, 446-452.

Kannegaard, P.N., Kreiner, S., Gregersen, P., Goldstein, H. (2005) Smoking habits and attitudes to smoking 2001 among hospital staff at a Danish hospital - Comparison with a similar study 1999. *Preventive Medicine* 41:1, 321-327.

Kaplan, B., Yogev, Y., Fisher, M., Gall, B., Dekel, A., Sulkes, J., Rabinerson, D. (2002) Self-health attitudes and practices of obstetrics and gynecology nurses in Israel. *Clinical and Experimental Obstetrics and Gynecology* 29:2, 115-116.

Kenna, G.A., Wood, M.D. (2005) The prevalence of alcohol, cigarette and illicit drug use and problems among dentists. *Journal of the American Dental Association* 136:7, 1023-1032.

Kinn, S., Curzio, J. (2005) Integrating qualitative and quantitative research methods. *Journal of Research in Nursing* 10:3, 317-336.

Kirkby, R.J., Bashkawi, E.B., Drew, C.A., Foenander, G.P. (1976) Smoking in nurses. *Medical Journal of Australia* 2:23, 864-865.

Kitajima, T., Ohida, T., Harano, S., Kamal, A.M., Takemura, S., Nozaki, N., Kawahara, K., Minaowa, M. (2002) Smoking behavior, initiating and cessation factors among Japanese nurses: A cohort study. *Public Health* 116:6, 347-352.

Mackay, J. (1996) Women and tobacco: International issues. *Journal of the American Medical Women's Association* 51:1-2, 48-51.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A., McElwee, G. (2001) Qualified nurses' smoking prevalence: Their reasons for smoking and desire to quit. *Journal of Advanced Nursing* 35:5, 769-775.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A., McElwee, G. (2003) The role of stress, peer influence and education levels on the smoking behaviour of nurses. *International Journal of Nursing Studies* 40:4, 359-366.

Melby, C.S. (2005) Examining the future of professional journals. *Nursing and Health Sciences* 7:4, 219-220.

Merchant, A., Pitiphat, W., Douglass, C.W., Crohin, C., Joshipura, K. (2002) Oral hygiene practices and periodontitis in health care professionals. *Journal of Periodontology* 73:5, 531-535.

Morra, M.E., Knobf, M.K. (1983) Comparison of nurses' smoking habits: The 1975 DHEW survey and Connecticut nurses, 1981. *Public Health Reports* 98:6, 553-557.

Mulhall, A. (2000) The case for a more epidemiologically informed nursing profession

Journal of Research in Nursing 5:1, 65-73.

Mundt, M.H., Glass, L.K., Michaels, C. (1995) A professional challenge: Nurses and smoking. *Journal of Community Health Nursing* 12:3, 139-146.

Myers, A.H., Rosner, B., Abbey, H., Willet, W., Stampfer, M.J., Bain, C., Lipnick, R., Hennekens, C., Speizer, F. (1987) Smoking behavior among participants in the nurses' health study. *American Journal of Public Health* 77:5, 628-630.

Nagle, A., Schofield, M., Redman, S. (1999) Australian nurses' smoking behaviour, knowledge and attitude towards providing smoking cessation care to their patients. *Health Promotion International* 14:2, 133-144.

Nardini, S., Bertoletti, R., Rastelli, V., Ravelli, L., Donner, C.F. (1998) Personal smoking habit and attitude toward smoking among the health staff of a general hospital. *Monaldi Archives of Chest Diseases* 53:1, 74-78.

Nelson, D.E., Giovino, G.A., Emont, S.L., Brackbill, R., Cameron, L.L., Peddicord, J., Mowery, P.D. (1994) Trends in cigarette smoking among US physicians and nurses. *Journal of the American Medical Association* 271:16, 1273-1275.

O'Connor, A.M., Harrison, M. (1992) Survey of smoking prevalence among Canadian nursing students and registered nurses. *Canadian Journal of Public Health* 83:6, 417-421.

Ohida, T., Osaki, Y., Kobayashi, Y., Sekiyama, M., Minowa, M. (1999) Smoking prevalence of female nurses in the national hospitals of Japan. *Tobacco Control* 8:2, 192-195.

Ohida, T., Kawahara, K., Osaki, Y., Sone, T., Kamal, A.M., Kawaguchi, T., Sekiyama, M., Harita, A., Minowa, M. (2000) Behaviors and attitudes towards smoking among the nurses in Japan. *Journal of Epidemiology* 10:5, 344-348.

Ohida, T., Takemura, S., Nozaki, N., Kawahara, K., Minowa, M., Mochizuki, Y. (2001) The validity of repeated mail surveys concerning smoking habits for

Japanese physicians. *Japanese Journal of Public Health* 48:8, 573-583 [in Japanese].

Ota, A., Yasuda, N., Okamoto, Y., Kobayashi, Y., Sugihara, Y., Koda, S., Kawakami, N., Ohara, H. (2004) Relationship of job stress with nicotine dependence of smokers - A cross-sectional study of female nurses in a general hospital. *Journal of Occupational Health* 46:3, 220-224.

Padula, C.A. (1992) Nurses and smoking: Review and implications. *Journal of Professional Nursing* 8:2, 120-132.

Patrick, D.L., Cheadle, A., Thompson, D.C., Diehr, P., Koepsell, T., Kinne, S. (1994) The validity of self-reported smoking: A review and meta-analysis. *American Journal of Public Health* 84:7, 1086-1093.

Pelkonen, M., Kankkunen, P. (2001) Nurses' competence in advising and supporting clients to cease smoking: A survey among Finnish nurses. *Journal of Clinical Nursing* 10:4, 437-441.

Petch-Levine, D., Young Cureton, V., Canham, D., Murray, M. (2003) Health practices of school nurses. *Journal of School Nursing* 19:5, 273-280.

Plant, M.L., Plant, M.A., Foster, J. (1991) Alcohol, tobacco and illicit drug use amongst nurses: A Scottish study. *Drug and Alcohol Dependence* 28:2, 195-202.

Plant, M.L., Plant, M.A., Foster, J. (1992) Stress, alcohol, tobacco and illicit drug use amongst nurses: A Scottish study. *Journal of Advanced Nursing* 17:9, 1057-1067.

Rahman, M., Fukui, T. (2003) Biomedical publication - Global profile and trend. *Public Health* 117:4, 274-280.

Rausch, J.C., Hopp, J., White, R. (1987) Determinants of smoking behavior among nurses. *Journal of Drug Education* 17:4, 365-377.

Reeve, K., Adams, J., Kouzekanani, K. (1996) The nurse as exemplar: Smoking status as a predictor of attitude toward smoking and smoking cessation. *Cancer Practice* 4:1, 31-33.

Retief, F.W., Prinsloo, E., Calitz, J., Barnes, J.M. (2003) Smoking among nursing staff at Tygerberg Hospital, Cape Town. *South African Medical Journal* 93:9, 661-663.

Rowe, K., Clark, J.M. (1999) Evaluating the effectiveness of a smoking cessation intervention designed for nurses. *International Journal of Nursing Studies* 36:4, 301-311.

Rowe, K., Clark, J. (2000a) Why nurses smoke: A review of the literature. *International Journal of Nursing Studies* 37:2 173-181.

Rowe, K., Clark, J. (2000b) The incidence of smoking amongst nurses: A review of the literature. *Journal of Advanced Nursing* 31:5, 1046-1053.

Royal College of Nursing Website (2006) *Why we all need a Breath of Fresh Air.* Available online: http://www.rcn.org.uk/news/campaigns/smokingban (21 September 2006)

Sarna, L.P., Brown, J.K., Lillington, L., Rose, M., Wewers, M.E., Brecht, M.L. (2000) Tobacco interventions by oncology nurses in clinical practice: Report from a national survey. *Cancer* 89:4, 881-889.

Sarna, L., Wewers, M.E., Brown, J.K., Lillington, L., Brecht, M.L. (2001) Barriers to tobacco cessation in clinical practice: Report from a National Survey of Oncology Nurses. *Nursing Outlook* 49:4, 166-172.

Sarna, L., Lillington, L. (2002) Tobacco: An emerging topic in nursing research. *Nursing Research* 51:4, 245-253.

Sarna, L., Bialous, S.A., Wewers, M.E., Froelicher, E.S., Danao, L. (2005) Nurses, smoking, and the workplace. *Research in Nursing and Health* 28:1, 79-90.

Sarna, L, Bialous S. (2005) Tobacco control in the 21st century: A critical issue for the nursing profession. *Research and Theory for Nursing Practice* 19:1, 15-24.

Seers, K., Crichton, N. (2001) Quantitative research: Designs relevant to nursing and healthcare. *Journal of Research in Nursing* 6:1, 487-500.

Sekijima, K., Seki, N., Suzuki, H. (2005) Smoking Prevalence and Attitudes toward Tobacco among Student and Staff Nurses in Niigata, Japan. *Tohoku Journal of Experimental Medicine* 206:3 187-194.

Senior, S.L. (1982) Study of smoking habits in hospital and attitudes of medical staff towards smoking. *Canadian Medical Association Journal* 126:2, 131-133.

Slater, P., McElwee, G., Fleming, P., McKenna, H. (2006) Nurses' smoking behaviour related to cessation practice. *Nursing Times* 102:19, 32-37.

Smith, D.R., Wei, N., Wang, R.S. (2005) Contemporary smoking habits among nurses in Mainland China. *Contemporary Nurse* 20:2, 258-266.

Smith, D.R., Adachi, Y., Mihashi, M., Ishitake, T. (2006) Tobacco smoking habits among a cross-section of nurses in a rural Japanese hospital. *Australian Journal of Advanced Nursing* (in press)

Spencer, J.K. (1984) Nurses' cigarette smoking in England and Wales. *International Journal of Nursing Studies* 21:2, 69-79.

Steptoe, A., Doherty, S., Kendrick, T., Rink, E., Hilton, S. (1999) Attitudes to cardiovascular health promotion among GPs and practice nurses. *Family Practice* 16:2, 158-163.

Stillman, F.A., Hantula, D.A., Swank, R. (1994) Creating a smoke-free hospital: Attitudes and smoking behaviors of nurses and physicians. *American Journal of Health Promotion* 9:2, 108-114.

Storr, C.L., Trinkoff, A.M., Hughes, P. (2000) Similarities of substance use between medical and nursing specialties. *Substance Use and Misuse* 35:10, 1443-1469.

Strobl, J., Latter, S. (1998) Qualified nurse smokers' attitudes towards a hospital smoking ban and its influence on their smoking behaviour. *Journal of Advanced Nursing* 27:1, 179-188.

Stubbs, J., Haw, C., Garner, L. (2004) Survey of staff attitudes to smoking in a large psychiatric hospital. *Psychiatric Bulletin* 28:6, 204-207.

Tobacco Free Nurses Website (2006) Available online: http://www.tobaccofreenurses.org

(21 September 2006)

Trinkoff, A.M., Storr, C.L. (1998) Substance use among nurses: Differences between specialties. *American Journal of Public Health* 88:4, 581-585.

Tselebis, A., Panaghiotou, A., Theotoka, I., Ilias, I. (2001) Nursing staff anxiety versus smoking habits. *International Journal of Nursing Practice* 7:3, 221-223.

Undertaking Nursing Interventions Throughout Europe (UNITE) Study Group. (2002) A survey of coronary risk factors in a cohort of cardiac nurses from Europe: Do nurses practise what they preach? *European Journal of Cardiovascular Nursing,* 1:1, 57-60.

Vartiainen, E., Seppala, T., Lillsunde, P., Puska, P. (2002) Validation of self reported smoking by serum cotinine measurement in a community-based study. *Journal of Epidemiology and Community Health* 56:3, 167-170.

Walker, W. (2005) The strengths and weaknesses of research designs involving quantitative measures. *Journal of Research in Nursing* 10:1, 571-582.

Willaing, I., Jørgensen, T., Iversen, L. (2003) How does individual smoking behaviour among hospital staff influence their knowledge of the health consequences of smoking? *Scandinavian Journal of Public Health* 31:2, 149-155.

World Health Organization Website (WHO) (2006) *Tobacco Free Initiative: Why is tobacco a public health priority?* Available at: http://www.who.int/tobacco/health_priority/en/index.html (21 September 2006)

Yang, M.S., Yang, M.J., Pan, S.M. (2001) Prevalence and correlates of substance use among clinical nurses in Kaohsiung city. Kaohsiung *Journal of Medical Sciences* 17:5, 261-269.

Yankie, V.M., Price, H.M., Nanfito, E.R., Jasinski, D.M., Crowell, N.A., Heath, J. (2006) Providing smoking cessation counseling: A national survey among nurse anesthetists. *Critical Care Nursing Clinics of North America* 18:1, 123-129.

Zanetti, F., Gambi, A., Bergamaschi, A., Gentilini, F., De Luca, G., Monti, C., Stampi, S. (1998) Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health* 112:1, 57-62.

Table 1 A Summary of International Tobacco Smoking Research Conducted in the Nursing Profession: 1976 to 2006

Smoking Rate [a]				Study Details [b]					Publication Details	
Country	**All**	**Male**	**Female**	**Category [c]**	**Method**	**Setting**	**N**	**Response**	**Authors**	**Year [d]**
Australia	21	-	-	All	Internal Mail	Multiple Hospitals	1457	80	Hughes and Rissel	1999
Australia	22	-	-	All	Interview	Multiple Hospitals	335	88	Nagle et al	1999
Australia	16	-	-	All	n/s	Single Hospital	1303	59	Jones et al	1998
Australia	53	56	52	All	n/s	Multiple Hospitals	220	n/s	Kirkby et al	1976
Balkans	51	-	-	All	Hand Delivered	Multiple Hospitals	97	81	Hodgetts et al	2004
Canada	12	-	-	All	Postal Survey	Membership Survey	1269	65	Chalmers et al	2000
Canada	17	-	-	All	Postal Survey	Membership Survey	1714	85	O'Connor and Harrison	1992
Canada	17	-	-	All	Postal Survey	Membership Survey	4776	85	Harrison	1991
Canada	-	-	23	All	Hand Delivered	Multiple Hospitals	822	90	Dore and Hoey	1988
Canada	32	-	-	All	n/s	Single Hospital	508	n/s	Senior	1982
China	3	52	-	All	Hand Delivered	Multiple Hospitals	509	98	Smith et al	2005
Denmark	18	-	-	All	Postal Survey	Single Hospital	729	75	Kannegaard et al	2005
Denmark	28	-	-	All	Postal Survey	Single Hospital	445	91	Willaing et al	2003
Finland	11	-	-	All	Postal Survey	Membership Survey	882	71	Pelkonen and Kankkunen	2001
Finland	15	-	-	OH	Postal Survey	National Survey	727	72	Heloma et al	1998
France	34	-	-	All	n/s	Single Hospital	895	83	Cooreman et al	1989
Germany	29	-	-	All	Census Data	National Survey	3981	n/s	John and Hanke	2003
Greece	46	-	-	All	n/s	Multiple Hospitals	308	73	Beletsioti-Stika and Scriven	2006
Greece	-	-	46	RSP	n/s	Single Hospital	114	n/s	Tselebis et al	2001
Hong Kong	1	-	-	All	Hand Delivered	Multiple Hospitals	1843	50	Johnston et al	2005
Hong Kong	16	-	-	All	Postal Survey	Membership Survey	92	46	Callaghan et al	1997
Israel	45	-	-	OBG	Postal Survey	Multiple Hospitals	290	83	Kaplan et al	2002

Italy	44	-	-	All	Hand Delivered	Single Hospital	959	57	Nardini et al	1998
Italy	41	40	42	All	Hand Delivered	Multiple Hospitals	1313	68	Zanetti et al	1998
Japan	11	19	11	All	Hand Delivered	Single Hospital	860	74	Smith et al	2006
Japan	-	-	16	All	Hand Delivered	Single Hospital	432	96	Sekijima et al	2005
Japan	-	-	12	All	Hand Delivered	Single Hospital	332	n/s	Ota et al	2004
Japan	-	-	34	All	Hand Delivered	Multiple Hospitals	1195	80	Kitajima et al	2002
Japan	-	75	15	All	Hand Delivered	Multiple Hospitals	1152	n/s	Ohida et al	2000
Japan	-	-	19	All	Hand Delivered	National Survey	2207	92	Ohida et al	1999
New Zealand	18	27	18	All	Census Data	National Survey	30507	n/s	Hay	1998
New Zealand	-	39	31	All	Census Data	National Survey	30720	n/s	Hay	1984
New Zealand	-	49	36	All	Census Data	National Survey	27323	n/s	Hay	1980
South Africa	31	-	-	All	Hand Delivered	Single Hospital	80	80	Retief et al	2003
Taiwan	-	-	1	All	Postal Survey	Multiple Hospitals	907	98	Yang et al	2001
United Kingdom	35	-	-	PSY	Internal Mail	Single Hospital	92	58	Bloor et al	2006
United Kingdom	17	-	-	PSY	Postal Survey	Single Hospital	167	39	Dickens et al	2004
United Kingdom	26	-	-	PSY	Postal Survey	Single Hospital	476	38	Stubbs et al	2004
United Kingdom	26	-	-	All	Postal Survey	Multiple Hospitals	1074	60	McKenna et al	2003
United Kingdom	-	17	7	CD	Hand Delivered	Conference Survey	130	25	UNITE Study Group	2002
United Kingdom	21	-	-	All	Hand Delivered	Single Hospital	555	84	Rowe and Clark	1999
United Kingdom	7	-	-	GP	Postal Survey	Multiple Hospitals	58	100	Steptoe et al	1999
United Kingdom	26	-	-	All	Hand Delivered	Single Hospital	418	92	Hope et al	1998
United Kingdom	14	-	-	All	Postal Survey	Journal Readers	1000	5	Alderman	1997
United	20	-	-	All	Postal Survey	Single Hospital	1069	82	Hussain et al	1993

Kingdom										
United Kingdom	26	-	-	TUT	Internal Mail	Multiple Hospitals	51	88	Blakey and Seaton	1992
United Kingdom	-	47	39	All	Interview	Multiple Hospitals	600	89	Plant et al	1991
United Kingdom	21	-	-	All	Hand Delivered	Single Hospital	663	70	Davies and Rajan	1989
United Kingdom	40	-	-	All	n/s	Multiple Hospitals	1577	56	Spencer	1984
United States	10	-	-	All	Internal Mail	Multiple Hospitals	58	n/s	Brown et al	2006
United States	9	-	-	ANE	Postal Survey	Membership Survey	276	60	Yankie et al	2006
United States	12	-	-	All	Postal Survey	Health Department	129	73	Kenna and Wood	2004
United States	-	19	38	All	Postal Survey	National Survey	56458	n/s	Bain et al	2004
United States	10	-	-	All	Postal Survey	Multiple Hospitals	647	73	Braun et al	2004
United States	4	-	-	SCH	Hand Delivered	Conference Survey	388	97	Petch-Levine et al	2003
United States	-	-	16	All	Postal Survey	National Survey	381	74	Merchant et al	2002
United States	13	-	-	HHC	Hand Delivered	Membership Survey	98	94	Borrelli et al	2001
United States	7	-	-	ONC	Postal Survey	National Survey	1508	38	Sarna et al	2000
United States	14	-	-	ED	Multiple Methods	Single Hospital	129	74	Barrett et al	2000
United States	-	-	22	All	Postal Survey	Membership Survey	1951	49	Collins et al	1999
United States	14	-	-	All	Postal Survey	National Survey	4438	78	Trinkoff and Storr	1998
United States	-	-	7	ONC	Postal Survey	Membership Survey	316	65	Reeve et al	1996
United States	14	-	-	All	Postal Survey	Membership Survey	1538	77	Mundt et al	1995

United States	-	-	20	All	Postal Survey	Membership Survey	952	19	Blazer and Mansfield	1995
United States	18	-	-	All	Interview	National Survey	901	n/s	Nelson et al	1994
United States	16	-	-	All	n/s	Single Hospital	1008	39	Stillman et al	1994
United States	22	-	-	All	Postal Survey	Military Nurses	307	98	Alexander and Beck	1990
United States	20	-	-	CC	Hand Delivered	Workshop Survey	499	70	Haughey et al	1989
United States	22	-	-	All	Hand Delivered	Single Hospital	738	89	Brown and Kiss	1987
United States	-	-	34	All	Postal Survey	National Survey	91651	n/s	Myers et al	1987
United States	24	-	-	All	Postal Survey	Membership Survey	823	82	Feldman and Richard	1986
United States	22	-	-	All	Hand Delivered	Single Hospital	1380	80	Becker et al	1986
United States	26	-	-	All	Postal Survey	Membership Survey	545	52	Morra and Knobf	1983

[a] Smoking prevalence rates expressed in percent and rounded to the nearest whole number, [b] Number of nurses surveyed, [c] Category of nurses who were surveyed (All = All types of nurses, OH = Occupational health nurses, RSP = Respiratory care nurses, OBG = Obstetrics and gynaecology nurses, PSY = Psychiatric nurses, CD = Cardiac care nurses, TUT = Nurse tutors, ANE = Nurse anaesthetists, SCH = School nurses, HHC = Home health care nurses, ONC = Oncology nurses, ED = Emergency department nurses, CC = Critical care nurses), [d] Publication year, n/s = Not Specified

Part 4

Tobacco Smoking among Medical Students

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An International Review of Tobacco Smoking among Medical Students

ABSTRACT

We conducted a systematic international review of tobacco smoking habits among medical students. Particular attention was paid to countries where smoking rates have been historically well-documented in local journals, but were less often included in larger international review articles. The methodology involved a search of relevant Medical Subject Headings, after which the reference lists of journal papers were also examined to find additional publications. A total of 66 manuscripts met the inclusion criteria. The most common countries previously studied included India, the United States, Australia, Japan, Pakistan, Turkey and the United Kingdom. Overall, our review suggests that the prevalence of smoking among medical students varies widely between different countries, and also between male and female students within the same areas. Consistently low smoking rates were found in Australia and the United States, while generally high rates were reported in Spain and Turkey. Given their important future role as exemplars, more aggressive measures to help reduce tobacco smoking among medical students are clearly needed worldwide. Only when all medical students stop smoking can the medical profession expect to become genuine public health exemplars.

Introduction

Health professionals have an important role to play in the fight against tobacco. As individuals they can help educate the population, as community members they can support anti-smoking policies, and at a societal level, they can influence national and global tobacco control efforts.[1] Physicians occupy a key position in this regard, as they are uniquely placed to lead smoking cessation programs in the community.[2] Patients expect information, help and guidance from their primary care physician on a number of health-related matters.[3] Physicians also play an important role in helping patients to stop smoking.[4] As future physicians who will witness the continued burden of smoking-related diseases among their patients, medical students represent a primary target for tobacco prevention programs. The potential success of such programs may be suboptimal however, if the true dangers of smoking are not adequately recognized. As medical students progress through medical school for example, their knowledge of smoking-related disease naturally increases.[5] Nevertheless, substance use remains fairly common in this group,[6] and a superior knowledge of smoking-related risks does not always correlate with a lower rate of smoking among more senior medical students.[5]

Many researchers have investigated the conundrum of smoking among medical students. As early as 1966 in the United States, Mausner[7] noted that while the medical student of today is tomorrow's physician, around one-third of them still smoked tobacco. Research from Australia in the early 1970s also suggested a similar prevalence rate.[8] In 1985, the Tobacco and Health Committee of the International Union against Tuberculosis and Lung Disease (IUATLD) began a

large investigation on smoking habits among medical students in a variety of countries. The first publications focused on medical students in 14 European countries,[9] followed by research among 10 African and Middle Eastern countries[10] and nine Asian countries.[11] In 1993, Tessier et al[12] published another large study of smoking behavior among medical students in Australia, Japan, the United States, Russia and Estonia. Smoking rates among students were shown to vary widely from country to country.[13] In 2005, the World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC) and the Canadian Public Health Association (CPHA) developed what was termed the Global Health Professionals Survey (GHPS) to investigate tobacco smoking habits among medical, dental, nursing and pharmacy students in a variety of WHO member states. Results from their pilot study were published in 2005.[14]

While a large number of researchers have now investigated the issue of tobacco smoking among medical students, few systematic international reviews appear to have been conducted on this topic. The purpose of the current paper therefore, was to undertake a systematic international review on the prevalence of tobacco usage among medical students. We also paid particular attention to countries where smoking rates among medical students have been well-documented in local studies and domestic journals, but where the results were less often included in larger international reviews on the topic. These countries mainly included Asian regions such as India, Pakistan, Malaysia, Thailand and Mainland China, as well as other emerging nations within the European theatre, such as Turkey, Croatia, Yugoslavia and Tunisia. Despite this widely cast net, it

was nevertheless anticipated that a large proportion of all manuscripts would probably have arisen from North American or European research institutions.

Methods

Our current study began with an extensive literature review targeting manuscripts published in peer-reviewed journals relating to the topic of tobacco smoking among medical students. The review began with a search of relevant Medical Subject Headings (MeSH) such as 'smoking', 'tobacco' and 'medical student' on PubMed, the National Library of Medicine in the United States.[15] After identifying some initial journal papers, the search was repeated using keyword variations such as 'smoke', 'medical education' and 'substance use'. To be sure that we did not miss any manuscripts from the underrepresented countries previously mentioned, further country-specific keywords such as 'India', 'Pakistan', 'Malaysia', 'Thailand' and so on, were also added to the search. Due to the wide variety of languages used for publishing scientific articles on PubMed, our review was limited to manuscripts written in English. As scientific articles quickly go out of date in the research field, only articles published in the past 30 years (that is, between 1976 and 2006 were included in the current review. The reference lists of all journal papers located using these initial criteria were subsequently examined to find additional publications.

Manuscripts were sorted by country of origin and then arranged in descending order on a single table, depending on the year in which the study was published. All papers were assigned an ascending reference number based on the abovementioned criteria. For consistency, all smoking prevalence rates were

rounded to the nearest whole number, and listed as prevalence rates by gender, and as total group prevalence rates, wherever possible. The study design for each manuscript was assigned into the following four epidemiological categories: Single Grade (where only one grade of student was sampled), Multiple Grade (where multiple grades of student were sampled), Cross-Sectional (where a complete cross-section of students from the medical school had been sampled) and Longitudinal (where at least one grade of student was sampled at more than one point in time). Where a single grade of medical students was sampled in multiple locations, the number of grades actually sampled was listed after the grade. Year of study in medical course in which the sampled students were attending were also listed. Response rates for each study were examined, and then rounded to the nearest whole number for standardization purposes. Where authors had used a convenience sample with an unspecified response rate, or where the response rate could not be determined from the manuscript, this missing information was also indicated on the table.

Results and Discussion

A total of 66 manuscripts met the inclusion criteria for this review,[16-81] as indicated in Table 1. The most common countries in which they had been conducted included India, the United States, Australia, Japan, Pakistan, Turkey and the United Kingdom. The majority had been conducted as questionnaire surveys among a complete cross-section of students within a single medical school. The next most common methodology involved surveying a single grade of medical student, usually comprising those students in either the first grade or

fifth grade at university. The number of participants in each study ranged from 41[62] to 5744[76] with a median of roughly 400 students. Particularly large surveys of medical students' tobacco smoking habits (where over 2000 participants were sampled) have been conducted in the United States,[76] Turkey,[68] Spain[63] and Colombia.[27] Overall survey response rates ranged from 40%[63] to 100%[43,48-50,52,53,59,62,71] with a median response rate of approximately 90%. Few manuscripts had response rates below 50%[63,75,80] while the participation rate in seven other studies was not specified. These results suggest that tobacco smoking surveys of medical students are reasonably common in the literature, and appear to be reasonably well-performed.

One confounding factor noticed during this review was a lack of standardization regarding the definition of 'smoker'. Although most researchers classified their subjects dichotomously, as being either smokers or non-smokers, some other recall periods were occasionally used, such as daily smoker, occasional smoker, and so on. This shortfall is not only limited to tobacco smoking surveys of medical students however, having been previously noted as a common methodological issue in other review articles conducted among different populations.[82] The problem possibly arises when studying medical students due to the inherent difficulties in determining tobacco usage habits over time, and the fact that most investigations investigate the point-prevalence of smoking among the surveyed group. Medical students, as indeed all university students, represent a widely-dispersed group who are often away from campus while undertaking practical training. This methodological limitation suggests that

surveys conducted among single grades during lecture periods are probably the most practical manner for investigating the topic. Whatever the cause of these methodological shortfalls, the issue of what exactly comprises a 'currently smoking' medical student clearly represents an area on which some international agreement should be reached, in order to allow greater comparability between future investigations. Nevertheless, despite the existence of certain confounding factors, a large proportion of all manuscripts we located had reasonably large sample sizes (in the hundreds), and sufficiently high response rates to allow confidence in the published data. Results from the surveys conducted among a cross-section of students within a single medical school also permits some analysis of the changing nature of smoking as student progress through their studies.

When considered from an international perspective, the prevalence of smoking among medical students appears to vary widely from country to country. The lowest overall prevalence rates of 2%-3% were documented in American medical schools during the late 1990s,[75-77] with similar low levels also reported in Australia (3%),[17] China (3%)[26] and India (4%).[37] Smoking prevalence rates below 10% of the medical student population were shown to occur in Australia (4%-6%),[18-21] China (6%),[24] India (7%),[41] Thailand (7%),[64] the US (7%),[78] and Malaysia (9%).[51,52] Marked differences in smoking rates were found by gender in almost all studies, with male students generally having the higher rates. From the current review it appears that the international prevalence of tobacco smoking among male medical students ranges between 3% in the United States[77] to 58% in Japan.[49] Other

relatively high prevalence rates among male medical students were also documented in Greece (41%)[30] and Spain (42%).[63]

While the smoking prevalence rate among female students was generally lower than their male counterparts at the same medical school across a range of studies, at least seven investigations reported not having any female smokers at all. This particular phenomenon was seen among research conducted in China,[24,25] India,[37,43] Malaysia[51,52] and Thailand.[64] It has been previously suggested that smoking may be regarded as inappropriate behavior for women in certain countries,[5,83] a cultural consideration which may have led to the situation observed among female medical students in the current review. Nevertheless, it is also possible that some females who did actually smoke in these countries may not have admitted their smoking habit during the survey for similar reasons. Aside from countries where the smoking prevalence among female medical students was reported to be either zero or was not recorded at all, very low smoking prevalence rates of only 1% were also documented among female students in China,[26] Malaysia,[53] Pakistan,[57] and Tunisia.[65] Again, these low results seem to suggest a cultural reluctance for women to smoke in certain countries.

Aside from gender issues, the results of tobacco smoking studies which sampled a complete cross-section of medical students are also interesting to consider. In this regard, one of the most important issues is to what extent tobacco usage increases as a student progresses through medical school. As previously mentioned, our current review located numerous studies which had

been conducted among a cross-section of students at the same medical school. Almost all of them found that tobacco smoking rates among medical students tend to increase between the year of entry and the final year. In India for example, Ramakrishna et al[37] reported that the tobacco smoking prevalence ranged from 7% among male 1st year students to 16% among 5th year students. Also in India, Singh et al[40] found that smoking rates increased from 17% to 43% between the 1st and 5th years, while Sandell et al[42] observed a similar trend, albeit with lower overall prevalence rates (ranging from 4% in the 1st year to 10% in the 4th and 5th years). An earlier Indian study from the late 1970s conducted by Singh et al[44] suggested that smoking prevalence rates in the 1970s also followed a similar trend (ranging from 27% in the 1st year to 49% by the intern period). Research conducted in Manchester by Elkind[73] documented a prevalence rate rising from 16% in the 1st year to 20% in the 5th year. Similarly in Yugoslavia, Vlajinac et al[81] demonstrated that smoking rates increased from 27% to 36% during the five years of medical school. Not all studies of tobacco usage among medical students demonstrated a linear trend of increasing prevalence however. In the United States for example, Patkar et al[75] found that tobacco smoking rates fluctuated from 3.3% in the 1st year, to 2.5% in the 2nd year and then back up to 3.8% in the 3rd and 4th years. In Iran, Ahmadi et al[45] also revealed that tobacco usage ranged from 18% in the 1st year group, to 7% in the 3rd year group and then back up to 17% in the 4th year group. Considering the results of previous investigations and the fact that response rates were not mentioned, the possibility of demographic differences in the 3rd year group of Ahmadi et al's[45] study, should be considered.

Our current review located several longitudinal studies of tobacco smoking which had been conducted on medical students in Australia,[18] India,[39,41] Ireland,[46] Japan,[47] Malaysia[51] and Turkey.[67] Results from these investigations are worthy of discussion. In the first study, Roche[18] targeted three separate groups of male and female students in their 5th year of study at an Australian medical school. Surveys were conducted in 1986, 1990 and 1993, with response rates of 65%, 73% and 68%, respectively. The prevalence of smoking among them steadily declined over the eight year period, beginning at 10% in 1986, falling to 4% in 1990 and then to 3% in 1993.[18] In another study, Venkataraman et al[39] investigated 10 successive groups of male student enrolled at an Indian medical school between 1955 and 1988. Similar to Roche,[18] the Indian authors also found that the overall prevalence of smoking was in decline, falling from 42% (in the period 1955-60) to 25% (in the period 1985-1988).[39] Boland et al[46] followed three separate groups of male and female students at an Irish medical school between 1973 and 2002. The 1973 investigation targeted students in their 1st, 3rd, 4th and 6th year of study, while in 1990 and 2002 all six years of the medical school were surveyed. The overall prevalence of smoking declined from 29% in 1973, to 15% in 1990 and then 10% in 2002.[46] In Malaysia, Frisch et al[51] recruited a cohort of male and female medical students in their first year of study during 1991-92, following them up two years later in the 1993-94 school year. Unlike the three previous investigations, the prevalence of smoking among this Malaysian cohort actually increased from 9% to 11% during the follow-up period. Interestingly, all smokers were male, with no female smokers in either group.[51]

The most recent longitudinal study of tobacco smoking among medical students appears to have been conducted in Turkey by Senol and colleagues.[67] In this investigation, 22% of students (male and female) were smoking in the 1st year of study, a rate which had risen to 27% by the 6th year. Roughly one-third (32.3%) of Senol et al's[67] original non-smokers in the 1st year had also become smokers by the end of the 6th year at medical school. While it would no-doubt have been useful to compare the smoking habits of undergraduate medical students with postgraduate medical students, few if any researchers appear to have done so. Nevertheless, a Japanese investigation by Imai et al[84], which appeared to have considered this point was conducted in 2003, but it was published in Japanese and therefore had to be excluded from the current review. Even so, in order to meet the current information shortfall, future international researchers who look at tobacco smoking among medical students would probably benefit by expanding their study to include graduate medical students, wherever possible.

Conclusion

Overall, our review suggests that the prevalence of smoking among medical students varies widely between students of different countries, and also between male and female students within the same countries. Consistently low prevalence rates were documented in regions such as Australia and the United States, while generally high rates were seen in countries such as Spain and Turkey. While many cross-sectional investigations suggested that the prevalence of smoking seems to increase during the more senior grades, it is difficult to assess whether this trend directly reflects university seniority,

increasing age or both. Some researchers have suggested that the smoking habits of a medical student's parents may be very important.[81,85] On the other hand, some other research found no association between student's smoking rates at medical school and paternal smoking habit.[86] Whatever the underlying demographic correlates of tobacco usage, it can be seen from the current review that too many medical students still continue to smoke around the world. Given their important future role as exemplars, there are a few measures which will need to be considered in meeting this important public health dilemma.

Education represents probably the most critical issue in smoking cessation for both medical students and the general public alike. It has previously been noted that educating both physicians and medical students about the importance of smoking as a cause of disease represents the first step for getting them involved in smoking cessation.[87] While medical schools should therefore provide educational programs in this regard,[88] it has been suggested that not enough medical schools actually teach specific courses on tobacco control to their students.[89] Not doing so may allow an entrenched smoking culture to remain among the student demographic and thus jeopardize their future role as physicians involved in tobacco control programs. In Japan for example, a country with some of the highest historical and contemporary smoking rates, Kawakami[90] demonstrated that the intention of medical students to perform future smoking interventions was still unsatisfactory in the late 1990s, with only one-third even being actively interested in the topic. While medical schools should clearly be pressed to address this important issue, not all of them appear

to be doing so. A previous worldwide survey on this topic for example, suggested that medical schools will still need continued encouragement for undertaking adequate tobacco control education.[91] Postgraduate training in tobacco control may be worthwhile, as it has previously been suggested that this represents a time when basic medical education is actually completed.[92] Regardless of when medical educators actually begin teaching their students about tobacco control, it seems clear from the current review that this kind of education must become mandatory in future years. Only when all medical students stop smoking can the medical profession expect to become genuine public health exemplars.

References

1. World Health Organization (WHO). *The role of health professionals in tobacco control.* Geneva: WHO; 2005.

2. Roche AM, Eccleston P, Sanson-Fisher R. Teaching smoking cessation skills to senior medical students: A block-randomized controlled trial of four different approaches. *Prev Med* 1996; 25:251-258.

3. Saloojee Y, Steyn K. Educating medical students about tobacco. *S Afr Med J* 2005; 95: 330-331.

4. Davis RM. When doctors smoke. *Tob Control* 1993; 2:187-188.

5. Richmond R. Teaching medical students about tobacco. *Thorax* 1999; 54:70-78.

6. Flaherty JA, Richman JA. Substance use and addiction among medical students, residents, and physicians. *Psychiatr Clin North Am* 1993; 16:189-197.

7. Mausner JS. Smoking in medical students. A survey of attitudes, information, and smoking habits. *Arch Environ Health* 1966; 13:51-60.

8. Brackenridge CJ, Bloch S. Smoking in medical students. *J Psychosom Res* 1972; 16:35-40.

9. Tessier JF, Freour P, Crofton J, Kombou L. Smoking habits and attitudes of medical students towards smoking and antismoking campaigns in fourteen European countries. *Eur J Epidemiol* 1989; 5:311-321.

10. Tessier JF, Freour PP, Nejjari C, Belougne D, Crofton J. Smoking behaviour and attitudes of medical students towards smoking and anti-smoking campaigns: A survey in ten African and Middle Eastern countries. *Tob Control* 1992; 1:95-101

11. Tessier JF, Freour P, Belougne D, Crofton J. Smoking habits and attitudes of medical students towards smoking and antismoking campaigns in nine Asian countries. *Int J Epidemiol* 1992; 21:298-304.

12. Tessier JF, Freour PP, Nejjari C, Belougne D, Crofton J. Smoking behaviour and attitudes towards smoking of medical students in Australia, Japan, USA, Russia, and Estonia. *Tob Control* 1993; 2:24-29

13. Crofton JW, Freour PP, Tessier JF. Medical education on tobacco: Implications of a worldwide survey. Tobacco and Health Committee of the International Union against Tuberculosis and Lung Disease (IUATLD). *Med Educ* 1994; 28:187-196.

14. Centers for Disease Control and Prevention (CDC). Tobacco use and cessation counseling - Global health professionals survey pilot study, 10 countries, 2005. *MMWR Morb Mortal Wkly Rep* 2005; 54:505-509.

15. National Library of Medicine, United States, *Entrez PubMed Database*. Available at: http://www.ncbi.nlm.nih.gov/entrez (Accessed September 2006)

16. Vakeflliu Y, Argjiri D, Peposhi I, Agron S, Melani AS. Tobacco smoking habits, beliefs, and attitudes among medical students in Tirana, Albania. *Prev Med* 2002; 34:370-373.

17. Richmond RL, Kehoe L. Smoking behaviour and attitudes among Australian medical students. *Med Educ* 1997; 31:169-176.

18. Roche AM. Have efforts to improve medical students' drug and alcohol knowledge, skills and attitudes worked? *Drug Alcohol Rev* 1997; 16:157-170.

19. Roche AM, Eccleston P, Jordan D. Smoking-related knowledge and attitudes of senior Australian medical students. *Tob Control* 1996; 5:271-279.

20. Roche AM, Beauchamp P. Smoking prevalence among senior medical students. *Med J Aust* 1994; 160:447-448.

21. Engs RC. The drug-use patterns of helping-profession students in Brisbane, Australia. *Drug Alcohol Depend* 1980; 6:231-246.

22. Daudt AW, Alberg AJ, Prola JC, Fialho L, Petracco A, Wilhelms A, Weiss A, Estery C. A first step incorporating smoking education into a Brazilian medical school curriculum: Results of a survey to assess the cigarette smoking knowledge, attitudes, behaviour, and clinical practices of medical students. *J Addict Dis* 1999; 18:19-29.

23. Paine PA, Amaral JA, Pereira MG. Association between parental and student smoking behaviour in a Brazilian medical school. *Int J Epidemiol* 1985; 14:330-332.

24. Smith DR, Wei N, Wang RS. Tobacco smoking habits among Chinese medical students and their need for health promotion initiatives. *Health Promot J Austr* 2005; 16:233-235.

25. Xiang H, Wang Z, Stallones L, Yu S, Gimbel HW, Yang P. Cigarette smoking among medical college students in Wuhan, People's Republic of China. *Prev Med* 1999; 29:210-215.

26. Lei Z, Jingheng H, Jianzhong L. Smoking among Shanghai medical students and the need for comprehensive intervention strategies. *Health Promot Int* 1997; 12:27-32.

27. Rosselli D, Rey O, Calderon C, Rodriguez MN. Smoking in Colombian medical schools: The hidden curriculum. *Prev Med* 2001; 33:170-174.

28. Trkulja V, Zivcec Z, Cuk M, Lackovic Z. Use of psychoactive substances among Zagreb University medical students: Follow-up study. *Croat Med J* 2003; 44:50-58.

29. Brenner H, Scharrer SB. Parental smoking and sociodemographic factors related to smoking among German medical students. *Eur J Epidemiol* 1996; 12:171-176.

30. Sichletidis LT, Chloros D, Tsiotsios I, Kottakis I, Kaiafa O, Kaouri S, Karamanlidis A, Kalkanis D, Posporelis S. High prevalence of smoking in Northern Greece. *Prim Care Respir J* 2006; 15:92-97.

31. Mammas IN, Bertsias GK, Linardakis M, Tzanakis NE, Labadarios DN, Kafatos AG. Cigarette smoking, alcohol consumption, and serum lipid profile among medical students in Greece. *Eur J Public Health* 2003; 13: 278-282.

32. Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. *Soc Sci Med* 1993; 36: 817-822.

33. Waalkens HJ, Cohen Schotanus J, Adriaanse H, Knol K. Smoking habits in medical students and physicians in Groningen, The Netherlands. *Eur Respir J* 1992; 5:49-52.

34. Piko BF. Does knowledge count? Attitudes toward smoking among medical, nursing, and pharmacy students in Hungary. *J Community Health* 2002; 27:269-276.

35. Piko B, Barabas K, Markos J. Health risk behaviour of a medical student population: Report on a pilot study. *J R Soc Health* 1996; 116:97-100.

36. Mohan S, Pradeepkumar AS, Thresia CU, Thankappan KR, Poston WS, Haddock CK, Pinkston MM, Muramoto ML, Nichter M, Nichter M, Lando HA. Tobacco use among medical professionals in Kerala, India: The need for enhanced tobacco cessation and control efforts. *Addict Behav* 2006 Mar 23; [Epub ahead of print]

37. Ramakrishna GS, Sankara Sarma P, Thankappan KR. Tobacco use among medical students in Orissa. *Natl Med J India* 2005; 18:285-289.

38. Sinha DN, Gupta PC. Tobacco and areca nut use in male medical students of Patna. *Natl Med J India* 2001; 14:176-178.

39. Venkataraman S, Mukhopadhya A, Muliyil J. Trends of smoking among medical students. *Indian J Med Res* 1996; 104:316-320.

40. Singh SK, Narang RK, Chandra S, Chaturvedi PK, Dubey AL. Smoking habits of the medical students. *Indian J Chest Dis Allied Sci* 1989; 31:99-103.

41. Behera D, Malik SK. Smoking habit of undergraduate medical students. *Indian J Chest Dis Allied Sci* 1987; 29:182-184.

42. Sandell J, Singh S, Sati TK, Mehrotra SK. A study of smoking habits of medical students of Uttar Pradesh. *Indian J Public Health* 1983; 27:96-101.

43. Roy M, Chakraborty AK. Smoking and drug-abuse among the newly admitted students of medical colleges in West Bengal. *Indian J Public Health* 1981; 25:30-35.

44. Singh G, Singh R, Jindal KC. Drug use among physicians and medical students. *Indian J Med Res* 1981; 73:594-602.

45. Ahmadi J, Khalili H, Jooybar R, Namazi N, Aghaei PM. Cigarette smoking among Iranian medical students, resident physicians and attending physicians. *Eur J Med Res* 2001; 6:406-408.

46. Boland M, Fitzpatrick P, Scallan E, Daly L, Herity B, Horgan J, Bourke G. Trends in medical student use of tobacco, alcohol and drugs in an Irish university, 1973-2002. *Drug Alcohol Depend* 2006 May 28; [Epub ahead of print]

47. Ozasa K, Shigeta M, Hayashi K, Yuge M, Watanabe Y. Smoking prevalence in Japanese medical students, 1992-2004. *Med Educ* 2005; 39:971-972.

48. Kusunoki T, Hosoi S, Asai K, Harazaki M, Furusho K. Relationships between atopy and lung function: results from a sample of one hundred medical students in Japan. *Ann Allergy Asthma Immunol* 1999; 83:343-347.

49. Kawane H. Antismoking education for medical students. Chest 1992; 101:1480.

50. Kawane H. Tobacco smoking in Japan. *Med J Aust* 1987; 146:503-504.

51. Frisch AS, Kurtz M, Shamsuddin K. Knowledge, attitudes and preventive efforts of Malaysian medical students regarding exposure to environmental tobacco and cigarette smoking. *J Adolesc* 1999; 22:627-634.

52. Yaacob I, Abdullah ZA. Smoking behavior, knowledge and opinion of medical students. *Asia Pac J Public Health* 1994; 7:88-91.

53. Wong ML, Chen PC. Smoking behaviour, knowledge and opinion of medical students. *Med J Malaysia* 1989; 44:317-323.

54. Khan FM, Husain SJ, Laeeq A, Awais A, Hussain SF, Khan JA. Smoking prevalence, knowledge and attitudes among medical students in Karachi, Pakistan. *East Mediterr Health J* 2005; 11:952-958.

55. Omair A, Kazmi T, Alam SE. Smoking prevalence and awareness about tobacco related diseases among medical students of Ziauddin Medical University. *J Pak Med Assoc* 2002; 52:389-392.

56. Hussain SF, Moid I, Khan JA. Attitudes of Asian medical students towards smoking. *Thorax* 1995; 50:996-997.

57. Ahmed EN, Jafarey NA. Smoking habits amongst medical students of Sind Medical College. *J Pak Med Assoc* 1983; 33:39-44.

58. Al-Turki YA. Smoking habits among medical students in Central Saudi Arabia. *Saudi Med J* 2006; 27:700-703.

59. Jarallah JS. Smoking habits of medical students at King Saud University, Riyadh. *Saudi Med J* 1992; 13:510-513.

60. Engs RC, Van Teijlingen E. Correlates of alcohol, tobacco and marijuana use among Scottish postsecondary helping-profession students. *J Stud Alcohol* 1997; 58:435-444.

61. Kavcova E, Kocan I, Squier C. Tobacco control and the role of the medical community in the Slovak Republic. *Eur J Dent Educ* 2004; 8 Suppl 4:46-50.

62. San-Pedro EM, Roales-Nieto JG, Blanco-Coronado JL. Tobacco use among Spanish physicians and medical students. *Tob Control* 2006; 15:272.

63. Rodriguez ME, Cami J. Substance use among medical students in Barcelona (Spain). A comparison with previous surveys. *Drug Alcohol Depend* 1986; 18:311-318.

64. Songkla YN, Saenghirunvattana S. Smoking among medical students. *J Med Assoc Thailand* 1985; 68:198-200.

65. Harrabi I, Ghannem H, Kacem M, Gaha R, Ben Abdelaziz A, Tessier JF. Medical students and tobacco in 2004: A survey in Sousse, Tunisia. *Int J Tuberc Lung Dis* 2006; 10:328-332.

66. Akvardar Y, Demiral Y, Ergor G, Ergor A. Substance use among medical students and physicians in a medical school in Turkey. *Soc Psychiatry Psychiatr Epidemiol* 2004; 39:502-506.

67. Senol Y, Donmez L, Turkay M, Aktekin M. The incidence of smoking and risk factors for smoking initiation in medical faculty students: Cohort study. *BMC Public Health* 2006; 6:128.

68. Kocabas A, Burgut R, Bozdemir N, Akkoclu A, Cildag O, Dagli E, Erkan L, Isik R, Turktas H. Smoking patterns at different medical schools in Turkey. *Tob Control* 1994; 3:228-235.

69. Gulec M, Bakir B, Ozer M, Ucar M, Kilic S, Hasde M. Association between cigarette smoking and depressive symptoms among military medical students in Turkey. *Psychiatry Res* 2005; 134:281-286.

70. Melani AS, Verponziani W, Boccoli E, Trianni GL, Federici A, Amerini R, Vichi MG, Sestini P. Tobacco smoking habits, attitudes and beliefs among nurse and medical students in Tuscany. *Eur J Epidemiol* 2000; 16:607-611.

71. Webb E, Ashton CH, Kelly P, Kamah F. An update on British medical students' lifestyles. *Med Educ* 1998; 32:325-331.

72. Ashton CH, Kamali F. Personality, lifestyles, alcohol and drug consumption in a sample of British medical students. *Med Educ* 1995; 29:187-192.

73. Elkind AK. Changes in the smoking behaviour, knowledge and opinion of medical students, 1972-1981. *Soc Sci Med* 1982; 16:2137-2143.

74. Birkner FE, Kunze M. Smoking patterns at a British and at an American medical school. *Med Educ* 1978; 12:128-132.

75. Patkar AA, Hill K, Batra V, Vergare MJ, Leone FT. A comparison of smoking habits among medical and nursing students. *Chest* 2003; 124:1415-1420.

76. Sockrider MM, Maguire GP, Haponik E, Davis A, Boehlecke B. Attitudes of respiratory care practitioners and students regarding pulmonary prevention. *Chest* 1998; 114:1193-1198.

77. Mangus RS, Hawkins CE, Miller MJ. Tobacco and alcohol use among 1996 medical school graduates. *JAMA* 1998; 280:1192-1193, 1195.

78. Najem GR, Passannante MR, Foster JD. Health risk factors and health promoting behavior of medical, dental and nursing students. *J Clin Epidemiol* 1995; 48:841-849.

79. Baldwin DC Jr, Hughes PH, Conard SE, Storr CL, Sheehan DV. Substance use among senior medical students. A survey of 23 medical schools. *JAMA* 1991; 265:2074-2078.

80. Conard S, Hughes P, Baldwin DC Jr, Achenbach KE, Sheehan DV. Substance use by fourth-year students at 13 U.S. medical schools. *J Med Educ* 1988; 63:747-758.

81. Vlajinac H, Adanja B, Jarebinski M. Cigarette smoking among medical students in Belgrade related to parental smoking habits. *Social Sci Med* 1989; 29:891-894.

82. Smith DR, Leggat PA. A comparison of tobacco smoking among dentists in 15 countries. *Int Dent J* 2006; 56: 283-288.

83. Ernster V, Kaufman N, Nichter M, Samet J, Yoon SY. Women and tobacco: Moving from policy to action. *Bull World Health Organ* 2000; 78:891-901.

84. Imai H, Konno K, Musashi M, Tamashiro H. A survey on smoking behavior in Hokkaido University School of Medicine, 2003. *Nippon Koshu Eisei Zasshi* 2004; 51:540-551 [in Japanese].

85. Brenner H, Scharrer S. Smoking habits of future physicians: A survey among medical students of a south German university. *Soz Praventivmed* 1996; 41:150-157.

86. Pathmanathan I. Smoking habits among medical students in the University of Malaya. *Med J Malaysia* 1975; 30:88-92.

87. Fowler G: Educating doctors in smoking cessation. *Tob Control* 1993; 2:5-6.

88. Wallace P. Medical students, drugs and alcohol: Time for medical schools to take the issue seriously. *Med Educ* 2000; 34:86-87.

89. Allen MB. Medical students' knowledge of smoking. *Thorax* 1999; 54:2.

90. Kawakami M. Awareness of the harmful effects of smoking and views on smoking cessation intervention among Japanese medical students. *Intern Med* 2000; 39:720-726.

91. Richmond RL, Debono DS, Larcos D, Kehoe L. Worldwide survey of education on tobacco in medical schools. *Tob Control* 1998; 7:247-252.

92. Roche AM, Sanson-Fisher RW, Cockburn J. Training experiences immediately after medical school. *Med Educ* 1997; 31:9-16.

Table 1 International Comparison of Tobacco Smoking Surveys Conducted among Medical Students between 1976 and 2006

Smoking Rate [a]				Details of Study [b]				Publication Details [c]		
Country	**All**	**Male**	**Female**	**Grades**	**Design**	**N**	**Response**	**Authors**	**Year**	**Reference**
Albania	14	34	5	1st Year	Single Grade	149	82	Vakeflliu et al	2002	16
Australia	3	-	-	1st & 5th Yrs	Multiple Grades	594	79	Richmond & Kehoe	1997	17
Australia	5	-	-	5th Year x 3	Longitudinal	379	69	Roche	1997	18
Australia	4	-	-	5th Year	Single Grade	173	79	Roche et al	1996	19
Australia	4	-	-	5th Year	Single Grade	250	79	Roche & Beauchamp	1994	20
Australia	6	-	-	1st & 4th Yrs	Multiple Grades	431	n/s	Engs	1980	21
Brazil	3	-	-	n/s	Cross-Sectional	513	73	Daudt et al	1999	22
Brazil	14	10	18	n/s	Single Grade	103	96	Paine et al	1985	23
China	6	13	0	4th Year	Single Grade	207	92	Smith et al	2005	24
China	-	38	0	All (Yrs 1-5)	Cross-Sectional	1540	96	Xiang et al	1999	25
China	3	6	1	All (Yrs 1-5)	Cross-Sectional	1392	86	Lei et al	1997	26
Colombia	26	28	24	1st & 5th Yrs	Multiple Grades	2021	90	Rosselli et al	2001	27
Croatia	29	-	-	All (Yrs 1-6)	Cross-Sectional	775	98	Trkulja et al	2003	28
Germany	24	29	18	1st,3rd,5th Yrs	Multiple Grades	696	85	Brenner & Scharrer	1996	29
Greece	41	41	40	n/s	Cross-Sectional	1072	n/s	Sichletidis et al	2006	30
Greece	-	33	28	(3rd Year) x 12	Longitudinal	849	98	Mammas et al	2003	31
Holland	18	19	16	n/s	Cross-Sectional	160	80	Dekker et al	1993	32
Holland	27	31	23	n/s	Cross-Sectional	725	95	Waalkens et al	1992	33
Hungary	36	-	-	4th Year	Single Grade	91	90	Piko	2002	34
Hungary	21	-	-	n/s	Multiple Grades	177	73	Piko et al	1996	35
India	-	8	-	All (Yrs 1-5)	Cross-Sectional	1130	75	Mohan et al	2006	36
India	4	5	0	All (Yrs 1-5)	Cross-Sectional	1189	74	Ramakrishna et al	2005	37
India	-	23	-	All (Yrs 1-5)	Cross-Sectional	400	93	Sinha & Gupta	2001	38
India	-	19	-	(n/s) x 10	Longitudinal	196	64	Venkataraman et al	1996	39
India	31	35	5	All (Yrs 1-5)	Cross-Sectional	854	66	Singh et al	1989	40

India	7	-	-	1st Year x 5	Longitudinal	355	70-82	Behera & Malik	1987	41
India	27	-	-	All (Yrs 1-5)	Cross-Sectional	1600	80	Sandell et al	1983	42
India	-	3	0	1st Year x 7	Single Grade	705	100	Roy & Chakraborty	1981	43
India	11	-	-	n/s	Cross-Sectional	672	90	Singh et al	1981	44
Iran	13	-	-	All (Yrs 1-4)	Cross-Sectional	421	25	Ahmadi et al	2001	45
Ireland	10	10	8	All (Yrs 1-6)	Longitudinal	537	94	Boland et al	2006	46
Japan	-	16-28	2-4	4th & 5th Yrs	Longitudinal	1366	n/s	Ozasa et al	2005	47
Japan	17	-	-	5th Year	Single Grade	100	100	Kusunoki et al	1999	48
Japan	-	58	-	5th Year	Single Grade	77	100	Kawane	1992	49
Japan	-	51	8	5th Year	Single Grade	129	100	Kawane	1987	50
Malaysia	9	-	0	1st Year	Longitudinal	148	95	Frisch et al	1999	51
Malaysia	9	22	0	All (Yrs 1-4)	Cross-Sectional	395	100	Yaacob & Abdullah	1994	52
Malaysia	10	17	1	3rd & 4th Yrs	Multiple Grades	271	100	Wong & Chen	1989	53
Pakistan	14	22	4	All (Yrs 1-5)	Cross-Sectional	271	90	Khan et al	2005	54
Pakistan	-	26	2	n/s	Multiple Grades	264	92	Omair et al	2002	55
Pakistan	11	17	4	n/s	Multiple Grades	289	89	Hussain et al	1995	56
Pakistan	-	21	1	All (Yrs 1-6)	Cross-Sectional	1363	62	Ahmed & Jafarey	1983	57
Saudi Arabia	-	13	-	n/s	Multiple Grades	322	81	Al-Turki	2006	58
Saudi Arabia	-	33	-	n/s	Cross-Sectional	414	100	Jarallah	1992	59
Scotland	-	23	17	n/s	Cross-Sectional	566	n/s	Engs & Teijlingen	1997	60
Slovak Republic	36	-	-	1st & 5th Yrs	Multiple Grades	185	98	Kavcova et al	2004	61
Spain	37	-	-	n/s	Single Grade	41	100	San-Pedro et al	2006	62
Spain	44	42	45	All (Yrs 1-5)	Cross-Sectional	2308	40	Rodriguez & Cami	1986	63
Thailand	7	-	0	Yrs 3-6	Multiple Grades	256	n/s	Songkla & Saenghirunvattana	1985	64
Tunisia	19	30	1	1st & 5th Yrs	Multiple Grades	230	74	Harrabi et al	2006	65
Turkey	32	39	22	1st & 6th Yrs	Multiple Grades	447	68-91	Akvardar et al	2003	66
Turkey	22	28	10	1st Year	longitudinal	126	98	Senol et al	2006	67
Turkey	-	31	10	1st ,4th,6th Yrs	Multiple Grades	3073	88	Kocabas et al	1994	68
Turkey	33	-	-	All (Yrs 1-6)	Cross-Sectional	690	89	Gulec et al	2005	69
Tuscany	30	40	25	1st Year	Single Grade	200	94	Melani et al	2000	70
United Kingdom	-	18	14	2nd Year	Single Grade	785	100	Webb et al	1998	71

United Kingdom	-	12	30	2nd Year	Single Grade	186	99	Ashton & Kamali	1995	72
United Kingdom	17	18	15	All (Yrs 1-5)	Cross-Sectional	1112	96	Elkind	1982	73
United Kingdom	35	-	-	2nd & 5th Yrs	Multiple Grades	134	67-91	Birkner & Kunze	1978	74
United States	3	-	-	All (Yrs 1-4)	Cross-Sectional	397	48	Patkar et al	2003	75
United States	2	-	-	(Yrs 1-4) x 17	Cross-Sectional	5744	n/s	Sockrider et al	1998	76
United States	2	3	2	(4th Year) x 8	Single Grade	548	55	Mangus et al	1998	77
United States	7	-	-	All (Yrs 1-4)	Cross-Sectional	105	50	Najem et al	1995	78
United States	10	-	-	4th Year	Single Grade	2046	67	Baldwin et al	1991	79
United States	5	-	-	(4th Year) x 13	Single Grade	589	41	Conard et al	1988	80
Yugoslavia	31	36	28	All (Yrs 1-5)	Cross-Sectional	1657	54	Vlajinac et al	1989	81

[a] Smoking rates listed by country and gender and rounded to the nearest whole number, [b] Study details including grade of student at medical school, study design, total number of participants and survey response rate (where the authors had used a convenience sample with an unspecified response rate, or where the response rate could not be located, this information is indicated on the table as n/s [not supplied]), [c] Publication details including the first authors of the study, the publication year and the reference number as listed in this manuscript

Part 5

Tobacco Smoking among Nursing Students

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A Systematic Review of Tobacco Smoking among Nursing Students

ABSTRACT

This study was conducted to systematically and critically evaluate the large number of academic publications which have investigated tobacco smoking among nursing students in recent years. It was performed as a state-of-the-art examination of all modern literature published in peer-reviewed, English-language journals since 1990. Although smoking appears to be fairly common among nursing students, its prevalence and distribution varies widely depending on the country of study and time period during which the research was undertaken. Although there is some evidence to suggest that smoking rates increase by year of study in the nursing course, not all research has shown a clear association in this regard. Similarly, the value of anti-smoking interventions for nursing students appears to be limited, based on currently available information. Given these conflicting issues, further research which helps to ascertain why student nurses do not wish to give up their habit is clearly needed both locally and internationally. The development of an international smoking questionnaire may also be useful to help standardize future research on tobacco usage among this vulnerable demographic.

Introduction

Although nurses are the largest professional group in health care, the rate of tobacco usage among them is known to be considerable (Adriaanse et al., 1991). This represents a major public health issue as nurses are significant community role models for smoking and other lifestyle factors. Many smokers will inevitably consult nurses for tobacco-related advice (Charlton et al., 1997). Nursing students also play a major role in smoking prevention, as many of their attitudes towards tobacco-related activities are developed during training (Baron-Epel et al., 2004). Previous studies have shown that a nursing student's intended preventive behaviour may be influenced by their own smoking habits, with those who smoke being less likely to give anti-smoking advice to future patients (Sejr & Osler 2002). For these reasons, tobacco smoking represents a very important issue for nursing students, and one which has led to a large number of investigations being conducted in recent years. Nevertheless, the quality of smoking research among them has varied over time, and some inconsistent results have been revealed. Given the increasing number of investigations which have recently been conducted, this systematic review was undertaken to help establish the prevalence, distribution and related factors for student tobacco smoking from an international perspective.

Methods

This systematic review was conducted as a state-of-the-art examination of all modern literature published in peer-reviewed nursing journals, relating to the topic of tobacco smoking among nursing students. As the nature of research changes over time and results quickly go out of date, it was considered

necessary to only include manuscripts published since 1990. For consistency, it was also decided that only English-language manuscripts would be included.

The initial literature review began with a Medline search of relevant MeSH (Medical Subject Headings) terms such as: 'smoking', 'tobacco', 'student' and 'nurse.' After identifying some preliminary studies, the search was repeated using variations of these key words such as 'smoke', 'students' and 'nursing'. For the aforementioned reasons, the search criteria were limited to language 'English' and date '1990 onwards'. From the initial searches, it was noted that although a surprisingly large number of epidemiological studies have investigated tobacco smoking among nursing students, many of the reports which were eventually included had not been easily located using basic searches. There were a few reasons for this. One major limitation when using common search engines is that not all nursing periodicals are listed on medical databases, particularly some of the older studies. Indeed it has been suggested that only 31 of approximately 6000 nursing journals in the world today are actually listed in the Institute of Scientific Information (ISI) Journal Citation Reports (Melby 2005). This suggests that any nursing literature review which locates its materials through search engines alone would clearly miss some important articles.

Another methodological issue, not only limited to the current study, is that biomedical research tends to have a general bias towards countries with higher economic ranking (Rahman & Fukui 2003). For both of these reasons, it was considered necessary to scan the reference lists of all manuscripts initially fitting

the above-mentioned criteria, in order to locate additional publications which were not initially listed on search engines. Another confounding factor across all investigations was a lack of standardisation regarding the definition of 'current smoker'. Although most studies referred to their subjects simply as being either 'current' smokers or not, some used recall periods of 1 week to 1 month in their definition of the term 'current'. This may have arisen due to the inherent difficulties in assessing smoking habits over time, and the fact that most investigations simply describe the point-prevalence of smoking within a certain group. In cases where there was ambiguity regarding smoking definition, composition of the student sample or research design; the corresponding author of the selected manuscript was contacted. No corresponding authors were contacted prior to the literature search, nor were any encouraged to submit their own work for inclusion in the review, prior to being contacted.

Although this review systematically targeted publications from a variety of countries with a range of different methods, four main categories of research study were identified. Firstly, there were investigations where all grades within an entire nursing school were surveyed at one point in time (complete cross-sectional studies). Second, were the studies targeting single or multiple grades of student, but which did not include the entire nursing school (single or multiple grade studies). Research conducted on a single cohort of students at one particular time and then followed up at a later date was also included (longitudinal studies), as too; investigations where a specific intervention was provided to help reduce smoking among nursing students (intervention studies). Given these clear distinctions in research methodologies, main results from this

review are displayed as four separate tables corresponding to these four methodological classifications. To standardise results throughout, smoking rates were listed as the prevalence of smoking among the entire group (males and females combined), all percentages of which were rounded to the nearest whole number. Response rates for each study were also rounded to the nearest whole number for standardisation purposes.

Results and Discussion

A total of 35 English-language studies which met the inclusion criteria had been published since 1990. Eleven were cross-sectional in design, 16 single or multiple grade, 5 longitudinal and 3 interventional. Refer to Tables 1 to 4. One initial finding was the relatively large number of studies which have investigated tobacco smoking among nursing students, as well as the generally large sample sizes (up to 3866) (Suzuki et al., 2005) and high response rates they obtained (up to 100%) (Centers for Disease Control and Prevention 2005; Sone 1997). As expected, there was a tendency for almost all studies to have been conducted in developed nations, which is consistent with the observations mentioned earlier (Rahman & Fukui 2003) and one which represents a ubiquitous limitation of epidemiological research in the modern world. Although many studies originated from the United States and the United Kingdom, a surprisingly large number had also been conducted in Japan, all of which were high quality.

The most accurate 'snapshot' of tobacco smoking prevalence was obtained by the complete cross-sectional studies, as indicated in Table 1. From the

publications located during this literature review, a number of important issues were established with regard to smoking prevalence. Firstly, the overall prevalence of smoking appears to vary widely, both from country to country and from year to year. In Iran for example Ahmadi et al (2004) revealed that only 3% of nursing students were smokers, whereas in Israel (Baron-Epel et al., 2004) and Greece (Krommydas et al., 2004) the rate was 22% and 36% respectively; even though all three studies were conducted in the same year. Interestingly, two Japanese investigations also showed wide variations in prevalence, with Sekijima et al. (2005) documenting a very low smoking rate of only 6%, whereas Suzuki et al. (2005) found a four times higher level in their study (24%). Both Japanese researchers achieved very high response rates during their surveys (96% and 93% respectively), suggesting that responder bias was not the reason. Possible reasons for the discrepancy may relate to the different demographics from which their samples were sourced; that is, the inherent differences between students who study nursing at a vocational college or those who study at universities. Either way, both Japanese studies revealed that smoking prevalence increased by year of study, with students in the senior grades smoking at higher rates than their junior colleagues. In the United States, Najem et al. (1995) also found that postgraduate nursing students smoked at higher rates when compared to undergraduates. Such findings may not be definitive however, with Charlton et al. (1997) revealing that tobacco use was actually more common among the first year nursing students of their particular study. West & Hargreaves (1995) also showed that although smoking beliefs did not change during training, the overall prevalence decreased. Based on the

findings of cross-sectional studies alone, it is difficult to ascertain whether smoking actually increases or decreases by year of study in the nursing course.

Seniority in the nursing course was not the only contentious issue however. In Scotland for example, Blakey & Seaton (1992) found that a small proportion of nursing students believed smoking was not very harmful to health. Similarly in Greece, Krommydas et al. (2004) revealed that smoking was actually more common among nursing students with asthma when compared to their non-asthmatic classmates, and that the overall rate was quite high (36%). The highest smoking rates appear to have been in Italy (Boccoli et al., 1996) and Great Britain (Carmichael & Cockroft 1990), where roughly half the students used tobacco (51% and 43%, respectively). In some studies, nursing students' smoking habits were associated with gender (Baron-Epel et al., 2004; Ahmadi et al., 2004) and other demographic items (Baron-Epel et al., 2004). A student's potential role in helping patients to quit may also be controversial, as Boccoli et al. (1996) found that only one quarter of their nursing students believed medical smoking cessations would be effective. Interestingly, the possibility of responder bias in smoking surveys has also been revealed by Carmichael & Cockroft (1990), who found that the prevalence of smoking was lowest among students who responded to the first mailing of their questionnaire. Despite these potential confounders, the results obtained from complete cross-sectional studies with high response rates are all useful, and tend to suggest that smoking remains a common problem for nursing students worldwide, even though some conflicting results were doccumented.

Surveying one or two grades appears to be the most common method for investigating tobacco smoking among nursing students. A total of 16 such investigations were located during this literature review, with sample sizes ranging from 100 (Piko, 2002) to 914 (O'Connor & Harrison, 1992), and response rates from 47% (Jenkins & Ahijevych 2003) to 100% (CDC 2005). Eleven authors surveyed a single grade of student, with five surveying two or three grades. Similar to the complete cross-section surveys summarised in Table 1, the overall prevalence of smoking (as derived from single grade or multiple grade studies) appears to vary widely, depending on country and year of study. Refer to Table 2. In Australia for example, Adams et al. (1994) revealed that two-thirds of their nursing students were smokers (65%), whereas in Uganda (CDC, 2005) the smoking rate was negligible (1%), even though both studies targeted students in the third grade. Excessive smoking rates were also revealed by Melani et al. (2000) and Andrea et al. (2001) who showed that roughly half of their Italian nursing students used tobacco (43% and 51%, respectively). In Japan, Ohida et al. (2001a) demonstrated that smoking rates differed among nurses undertaking advanced study in either midwifery or public health, with public health nursing students having the lower rate (13%).

Many single-grade studies revealed some interesting information with regard to student's personal smoking habits. In Australia, Clark et al. (2004) found that most students had actually begun smoking before entering their nursing school. In Canada however, O'Connor & Harrison (1992) showed that having friends who smoked was an important reason for commencing the habit. Jenkins & Ahijevych (2003) suggested that tension relief was the main reason for smoking.

Sone (1997) found that Japanese nursing students were frequently exposed to cigarette advertising in many different formats. Demographics may play an important role, as separate studies conducted in the United States (Patkar et al., 2003), Hungary (Piko 2002) and Italy (Melani et al., 2000), all revealed that nursing students were more likely to smoke than medical students at the same university. Student nurses may also have some confusion regarding their potential status as role models for appropriate behaviour (Chalmers et al., 2003). In Australia for example, Adams et al. (1994) demonstrated that hospital-based student nurses were unconvinced about the health promotion role of nurses, while in the United States, Gorin (2001) showed that current smokers were less likely to participate in tobacco control activities. This may relate to risk perceptions, as Andrea et al. (2001) revealed that smoking beliefs among Italian students were generic and drawn from unspecific information sources. Whatever the reason, the large number of single grade and multiple grade studies conducted in the past 15 years, have all revealed some important information on smoking habits among contemporary nursing students.

Although longitudinal studies represent an accurate method for determining the progression of smoking trends over time (particularly causation), very few investigations of this nature appear to have been conducted among nursing students. Researchers may be reluctant to begin such studies due to a potentially high dropout rate among nursing students as they work through their degree, a potentially high attrition rate for the follow up component, as well as other issues relating to ethical concerns and privacy issues when individuals have to be specifically re-contacted over a number of years. Nevertheless, a

total of five high-quality longitudinal studies were identified during this review, as shown in Table 3. Results from an additional longitudinal study (not shown in the table) were published by Schwartz & Zeger (1990), who reported that the overall smoking prevalence among their nursing students in Los Angeles was 18%. As the Los Angeles cohort was initially recruited in 1961 (Hammer et al., 1974), it did not meet the inclusion criteria for this review. Nevertheless, some additional information was revealed during the study and is worthy of mention. Firstly, passive smoking was shown to increase the incidence rates of respiratory symptoms among student nurses (Schwartz & Zeger 1990). Secondly, by the time of their graduation, 39% of the students had become smokers (Hammer et al., 1974).

Ohida et al. (2001b) conducted two high-quality longitudinal studies among students at Japanese nursing universities and vocational nursing schools. Over a two-year period, the prevalence of smoking increased by 10% at the vocational schools and 3% at the universities. The authors achieved high follow-up rates of 84% and 81% respectively, suggesting that response bias was minimized. A similar increase in smoking was reported in the United States by Shriver & Scott-Stiles (2000), who followed a second-year cohort of university students over two years and found that the prevalence of smoking had increased by 2% during this time. Similar to Ohida et al. (2001b), the American study benefited from a high follow-up rate (80%), although the total number of subjects in the final group was limited (only 57 remained by follow-up). In Italy, Boccoli et al. (1997) followed over 500 first-year students for two years and found that their smoking prevalence also increased by 7%. From a response

rate of 93%, these Italian authors showed that over half (54%) of their university-based nursing students were smoking by the end of the course (Boccoli et al., 1997).

Whether the results from these studies can be generalized internationally is not known however, as some contradictory evidence was revealed in Canada. In a longitudinal study of health behaviours (not only smoking), Clement et al. (2002), followed a first-year cohort of university students over three years and found that their smoking rate actually decreased by 2%, falling from 12% to 10%. Whether this represents a true decrease is not known however, as the final follow-up group consisted of only 52 students from the original 193, a follow-up rate of 27%. The importance of non-responder bias, that is smokers who refused to be followed up, suggests that the longitudinal results from this particular study should be treated with caution. Nevertheless, the finding that between 10% and 12% of Clement et al.'s (2002) Canadian nursing students smoke tobacco and that the percentage of non-smokers was significantly higher than for the general Canadian population (p. 262), adds greatly to the overall body of knowledge on this topic.

The prevention of tobacco smoking and the promotion of smoking cessation activities is an important goal in nursing. Despite this realisation and the fact many students continue to smoke, very few researchers have undertaken intervention studies among nursing students. Only three such manuscripts appear to have been published in English over the past 15 years, two from Ireland and one from Denmark. Refer to Table 4. Unfortunately, it also appears

that the overall benefits of tobacco smoking interventions are limited among university-based nursing students. In Denmark for example, Sejr & Osler (2002) recruited 220 students (of whom 18% were current smokers) and administered 8 lectures on the health consequences of smoking. The authors utilised a controlled study design, where participants were randomly allocated into either the intervention or control group. By the follow-up period seven weeks later however, no change in smoking rates was observed.

Rowe & Clark (1999) conducted a one-year smoking intervention among a small group of nursing students in Northern Ireland. The intervention consisted of individualized counselling based on the specific needs of each student. By the follow-up period one year later, 25% of smokers had quit. The relative value of this intervention should be treated with caution however, as participants were initially required to have 'expressed a desire to give up smoking'. Furthermore, participants were assigned to either the intervention program or comparison group 'based on their preferences' (p. 303). This suggests that students who did not wish to give up smoking were not included in the study, while students who preferred interventions were subsequently assigned to the intervention group. It is possible therefore, that the 25% reduction in smoking rates observed at follow-up may reflect a 25% effectiveness rate among students who already wanted to quit smoking. This is not to say that smoking interventions are not effective or should not be attempted, rather it is the overall subgroup of smokers among nursing students who should be targeted for aggressive intervention. In another study from Ireland, Hope et al. (1998) conducted a series of passive interventions and stress discussion groups for 169 nursing students, among

whom 34% were current smokers. By the follow-up period three years later, no significant change in smoking prevalence was observed, although there was an increase in the number of students who participated in regular exercise (another variable investigated during the study).

Although the results from these intervention studies appears to be a little disappointing, the value of antismoking interventions for nursing students should not be underestimated. Preventing nursing students from commencing smoking and helping those who already smoke to give up their habit represents a critical issue in nursing education. Although the intervention studies identified during this review did not appear to have achieved their goal in its entirety, all studies offered useful evidence as to how it might be accomplished in future. Sejr & Osler (2002) for example, found that nursing students' attitudes towards smoking and their intended preventive behaviour may be influenced by their own smoking behaviour, and that nursing students who smoke were less likely to give anti smoking advice. Rowe & Clark (1999) emphasized the importance of helping nurses to identify coping strategies and support systems which might help them quit smoking. The authors suggested that action is required at a number of levels, particularly the introduction of a clear non-smoking policy in all colleges of nursing. Rowe & Clark (1999) also advised that health promotion coordinators and peer support groups may be useful. Hope et al. (1998) further suggested that health promotion skills should be integrated into nurse education. Despite the absence of a clearly effective intervention, all of these strategies may be useful in helping to reduce the seemingly high rate of smoking among student nurses around the world.

Conclusion

Overall, this review has shown that although tobacco usage is fairly common among nursing students, its prevalence and distribution varies depending on the country of study and time period when the study was undertaken. Although there is some evidence to suggest that smoking rates increase by year of study in the nursing course, not all research has shown a clear association in this regard. Similarly, the value of anti smoking interventions for nursing students appears to be of limited value. Given these issues, further research which helps to ascertain why student nurses do not wish to give up their habit is clearly needed both locally and internationally. The development of an internationally standardized definition for tobacco smoking among this demographic may also be useful to help standardize future studies on tobacco smoking.

References

Adams, A., Bell, P.F., Pelletier, S.D., 1994. Nurses and smoking: A comparative study of students of nursing and teaching. *Australian Health Review* 17, 84-101.

Adriaanse, H., Van Reek, J., Zandbelt, L., Evers, G., 1991. Nurses' smoking worldwide. A review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959-1988. *International Journal of Nursing Studies* 28, 361-375.

Ahmadi, J., Maharlooy, N., Alishahi, M., 2004. Substance abuse: Prevalence in a sample of nursing students. *Journal of Clinical Nursing* 13, 60-64.

Andrea, M.S., Walter, V., Elena, B., Alfea, F., Piersante, S., 2001. A comparison of smoking habits, beliefs and attitudes among Tuscan student nurses in 1992 and 1999. *European Journal of Epidemiology* 17, 417-421.

Baron-Epel, O., Josephsohn, K., Ehrenfeld, M., 2004. Nursing students' perceptions of smoking prevention. *Nurse Education Today* 24, 145-151.

Blakey, R., Seaton, A., 1992. Smoking attitudes amongst nursing tutors and their students. *Health Bulletin (Edinburgh)*, 50, 417-421.

Boccoli, E., Federici, A., Trianni, G.L., Melani, A.S., 1997. Changes of smoking habits and beliefs during nurse training: A longitudinal study. *European Journal of Epidemiology* 13, 899-902.

Boccoli, E., Federici, A., Melani, A.S., De Paola, E., 1996. Results of a questionnaire about nurse students' smoking habits and knowledges in an Italian teaching school of nursing. *European Journal of Epidemiology* 12, 1-3.

Carmichael, A., Cockcroft, A., 1990. Survey of student nurses' smoking habits in a London teaching hospital. *Respiratory Medicine* 84, 277-282.

Centers for Disease Control and Prevention (CDC)., 2005. Tobacco use and cessation counselling - Global health professionals survey pilot study, 10 countries, 2005. *Morbidity and Mortality Weekly Report* 54, 505-509.

Chalmers, K., Seguire, M., Brown, J., 2003. Health promotion and tobacco control: Student nurses' perspectives. *Journal of Nursing Education* 42, 106-112.

Charlton, A., While, D., Mochizuki, Y., 1997. A survey into the smoking habits of nursing students. *Nursing Times* 93, 58-60.

Clark, E., McCann, T.V., Rowe, K., Lazenbatt, A., 2004. Cognitive dissonance and undergraduate nursing students' knowledge of, and attitudes about, smoking. *Journal of Advanced Nursing* 46, 586-594.

Clement, M., Jankowski, L.W., Bouchard, L., Perreault, M., Lepage, Y., 2002. Health behaviors of nursing students: A longitudinal study. *Journal of Nursing Education* 41, 257-265.

Gorin, S.S., 2001. Predictors of tobacco control among nursing students. *Patient Education and Counselling* 44, 251-262.

Hammer, .D.I., Hasselblad, V., Portnoy, B., Wehrle, P.F., 1974. Los Angeles student nurse study. Daily symptom reporting and photochemical oxidants. *Archives of Environmental Health* 28, 255-260.

Hope, A., Kelleher, C.C., O'Connor, M., 1998. Lifestyle practices and the health promoting environment of hospital nurses. *Journal of Advanced Nursing* 28, 438-447.

Jenkins, K., Ahijevych, K., 2003. Nursing students' beliefs about smoking, their own smoking behaviors, and use of professional tobacco treatment intervention. *Applied Nursing Research* 16, 164-172.

Krommydas, G., Kotrotsiou, E., Raftopoulos, V., Paralikas, T., Gourgoulianis, K.I., Molyvdas, P.A., 2004. Smoking in health science students with asthma. *Canadian Respiratory Journal* 11, 476.

Melani, A.S., Verponziani, W., Boccoli, E., Trianni, G.L., Federici, A., Amerini, R., Vichi, M.G., Sestini, P., 2000. Tobacco smoking habits, attitudes and beliefs among nurse and medical students in Tuscany. *European Journal of Epidemiology* 16, 607-611.

Melby, C.S., 2005. Examining the future of professional journals. *Nursing and Health Sciences* 7, 219-220.

Najem, G.R., Passannante, M.R., Foster, J.D., 1995. Health risk factors and health promoting behavior of medical, dental and nursing students. *Journal of Clinical Epidemiology* 48, 841-849.

O'Connor, A.M., Harrison, M., 1992. Survey of smoking prevalence among Canadian nursing students and registered nurses. *Canadian Journal of Public Health* 83, 417-421.

Ohida, T., Sakurai, A., Kamal, A., Sone, T., Takemura, S., Fukushima, T., 2001(a). Smoking among Japanese nursing students: A nationwide survey. *Tobacco Control* 10, 397.

Ohida, T., Kamal, A.A., Takemura, S., Sone, T., Minowa, M., Nozaki, S., 2001(b). Smoking behavior and related factors among Japanese nursing students: A cohort study. *Preventive Medicine* 32, 341-347.

Patkar, A.A., Hill, K., Batra, V., Vergare, M.J., Leone, F.T., 2003. A comparison of smoking habits among medical and nursing students. *Chest* 124, 1415-1420.

Piko, B.F., 2002. Does knowledge count? Attitudes toward smoking among medical, nursing, and pharmacy students in Hungary. *Journal of Community Health* 27, 269-276.

Rahman, M., Fukui, T., 2003. Biomedical publication – Global profile and trend. *Public Health* 117, 274-280.

Rowe, K., Clark, J.M., 1999. Evaluating the effectiveness of a smoking cessation intervention designed for nurses. *International Journal of Nursing Studies* 36, 301-311.

Schwartz, J., Zeger, S., 1990. Passive smoking, air pollution, and acute respiratory symptoms in a diary study of student nurses. *American Review of Respiratory Disease* 141, 62-67.

Sejr, H.S., Osler, M., 2002. Do smoking and health education influence student nurses' knowledge, attitudes, and professional behavior? *Preventive Medicine* 34, 260-265.

Sekijima, K., Seki, N., Suzuki, H., 2005. Smoking prevalence and attitudes toward tobacco among student and staff nurses in Niigata, Japan. *Tohoku Journal of Experimental Medicine* 206, 187-194.

Shriver, C.B., Scott-Stiles, A., 2000. Health habits of nursing versus non-nursing students: A longitudinal study. *Journal of Nursing Education* 39, 308-314.

Sone, T., 1997. Frequency of contact with cigarette advertising and smoking experience among young women in Japan. *Journal of Epidemiology* 7, 43-47.

Suzuki, K., Ohida, T., Yokoyama, E., Kaneita, Y., Takemura, S., 2005. Smoking among Japanese nursing students: Nationwide survey. *Journal of Advanced Nursing*, 49, 268-275.

West, R., Hargreaves, M., 1995. Factors associated with smoking in student nurses. *Psychology and Health* 10, 195-204.

Table 1 Complete Cross-Sectional Studies of Tobacco Smoking among Nursing Students

Reference	Country	Smoking Rate [a]	Setting	Grade	Sample Size	Response Rate [b]	Main Findings
Suzuki et al. (2005)	Japan	24%	27 Vocational nursing schools	All (Yrs 1-3)	3866	93%	Smoking prevalence increased by year of study in the nursing course
Sekijima et al. (2005)	Japan	6%	2 Nursing colleges & 1 university	All (Yrs 1-4)	716	96%	Smoking prevalence increased by year of study in the nursing course
Krommydas et al. (2004)	Greece	36%	1 University	All (Yrs 1-4)	268	98%	Smoking was more common among nursing students with asthma
Baron-Epel et al. (2004)	Israel	22%	3 Universities	All (Yrs 1-4)	782	69%	Smoking was associated with gender, ethnicity & religiosity
Ahmadi et al. (2004)	Iran	3%	1 University	All (Yrs 1-4)	400	93%	Smoking was associated with gender (much higher among males)
Charlton et al. (1997)	Great Britain	28%	1 University	All (Yrs 1-4)	96	72%	The prevalence of smoking was highest amongst first-year students
Boccoli et al. (1996)	Italy	51%	1 Nursing school	All (Yrs 1-3)	662	88%	Only 1/4 thought medical smoking cessations would be effective
Najem et al. (1995)	United States	11%	1 University	All (Yrs 1-4)	229	45%	A higher smoking rate was seen among post-graduate nursing students
West & Hargreaves (1995)	Great Britain	34%	1 Training hospital	All (Yrs 1-3)	146	58%	Smoking beliefs did not change during training, although the rate decreased
Blakey & Seaton (1992)	Scotland	33%	1 Nursing school	All (Yrs 1-3)	649	95%	A small proportion believed that smoking was not very harmful to health
Carmichael & Cockcroft (1990)	Great Britain	43%	1 Training hospital	All (Yrs 1-3)	350	95%	Smoking was lower among those who replied to the first mailing of the survey

[a] Smoking prevalence rates rounded to the nearest whole number, [b] Response rates rounded to the nearest whole number

Table 2 Single Grade or Multiple Grade Studies of Tobacco Smoking among Nursing Students

Reference	Country	Smoking Rate [a]	Setting	Grade	Sample Size	Response Rate [b]	Main Findings
CDC (2005)	Albania	42%	Nursing schools c	3rd Yr only	271	100%	Most thought that health care workers should be trained in smoking cessation techniques
	Bosnia / Herzegovina	33%	Nursing schools c	3rd Yr only	791	100%	Less than 30% had received formal training in smoking cessation counselling
	Uganda	1%	Nursing schools c	3rd Yr only	378	100%	Most thought that health care workers should give advice about smoking cessation
Clark et al. (2004)	Australia	24%	1 University	2nd & 3rd Yrs	366	86%	Many smokers begin their smoking habit before entering nursing school
Jenkins & Ahijevych (2003)	United States	6%	1 University	2nd, 3rd & 4th Yrs	200	47%	Tension relief was the main reason for smoking among student nurses
Chalmers et al. (2003)	Canada	13%	4 Universities	2nd, 3rd & 4th Yrs	272	62%	Nursing students may have confusion about themselves as role models
Patkar et al. (2003)	United States	14%	1 University	1st & 2nd Yrs	126	50%	Nursing students were more likely to smoke than medical students
Piko (2002)	Hungary	48%	1 University	3rd Yr only	100	90%	Nursing students were more likely to smoke than medical students
Andrea et al. (2001)	Italy	51%	5 Universities	1st Yr only	252	92%	Smoking beliefs were generic and drawn from unspecific information sources
Ohida et al. (2001a)	Japan	13%	17 Public health nursing schools	Single Yr Only d	539	91%	Smoking was less common among students in public health nursing schools
	Japan	22%	16 Midwifery schools	Single Yr Only d	325	95%	Nurses who had already qualified were less likely to smoke
Gorin (2001)	United States	24%	12 Nursing schools	2nd & 3rd Yrs	476	89%	Current smokers were less likely to participate in tobacco control activities
Melani et al. (2000)	Italy	43%	5 Universities	1st Yr only	205	88%	Nursing students were more likely to smoke than medical students
Sone (1997)	Japan	18%	3 Nursing schools	1st Yr only	197	100%	Nursing students were frequently exposed to cigarette advertising in different formats

Adams et al. (1994)	Australia	65%	1 University & 3 teaching hospitals	3rd Yr only	221	72%	Hospital student nurses were unconvinced about the health promotion role of nurses
O'Connor & Harrison (1992)	Canada	24%	33 Universities	4th Yr only	914	80%	Having friends who smoked was an important reason for commencing smoking

[a] Smoking prevalence rates rounded to the nearest whole number, [b] Response rates rounded to the nearest whole number, [c] The exact number of nursing schools was not listed, [d] Specialist nursing course of only 1 year duration

Table 3 Longitudinal Studies of Tobacco Smoking among Nursing Students

				Baseline				Follow Up			
Reference	**Country**	**Setting**	**Grade**	**Sample Size**	**Response Rate** [a]	**Smoking Rate** [b]	**Duration**	**Sample Size**	**Response Rate**	**Smoking Rate** [b]	**Main Findings**
Clement et al. (2002)	Canada	1 University	1st Yr	179	93%	12%	3 Years	52	27%	10%	Smoking rate decreased by 2%
Ohida et al. (2001b)	Japan	2 Vocational schools	1st & 2nd Yrs	266	93%	21%	1 Year	224	84%	31%	Smoking rate increased by 10%
	Japan	2 Colleges & universities	1st & 2nd Yrs	273	85%	9%	1 Year	222	81%	12%	Smoking rate increased by 3%
Shriver & Scott-Stiles (2000)	United States	1 University	2nd Yr only	71	100%	7%	2 Years	57	80%	9%	Smoking rate increased by 2%
Boccoli et al. (1997)	Italy	1 Nursing school	1st Yr only	536	95%	47%	2 Years	501	93%	54%	Smoking rate increased by 7%

[a] Response rates rounded to the nearest whole number, [b] Smoking prevalence rates rounded to the nearest whole number

Table 4 Intervention Studies which Address Tobacco Smoking among Nursing Students

Reference	Country	Setting	Grade	Sample Size	Smoking Rate [a]	Intervention Method	Time to follow up	Main Outcomes
Sejr & Osler (2002)	Denmark	1 University	1st Yr only	220	18%	8 lectures on the health consequences of smoking	7 Weeks	No change in smoking rates was observed
Rowe & Clark (1999)	Northern Ireland	1 University	All (Yrs 1-3)	65	46%	One session of individualized counselling	1 Year	25% of the smokers had quit by follow up
Hope et al. (1998)	Ireland	1 University	All (Yrs 1-3)	169	34%	Passive interventions and stress discussion groups	3 Years	No change in smoking rates was observed

[a] Smoking prevalence rates rounded to the nearest whole number

Chapter 2

Research Articles

Part 1

Tobacco Smoking among Dentists

Published as:

Smith DR, Leggat PA. Tobacco smoking prevalence among a cross-section of dentists in Queensland, Australia. *Kurume Medical Journal* 2005; 52 (4): 147-151

Tobacco Smoking Prevalence among a Cross-section of Dentists in Queensland, Australia

ABSTRACT

The purpose of this study was to investigate the epidemiology of tobacco smoking among dentists in Queensland, Australia. We utilized an anonymous, self-reporting questionnaire which was posted to 400 dentists during 2004. The overall response rate was 72.1%, among whom the prevalence of current smoking was estimated to be 3.9% (95%CI 2.2 – 6.9), with a further 11.0% being ex-smokers (95%CI 7.9 – 15.2). Smoking rates varied by age, with 6.1% of dentists aged younger than 30 years who were smokers. The lowest smoking prevalence was seen among dentists aged between 30 and 40 years (1.4%), and the highest among those aged over 60 years (7.1%). Regarding weekly work hours, the highest smoking prevalence was seen among dentists who worked between 25 and 35 hrs per week (6.8%). Ex-smokers were more likely to work less than 25 hrs per week (21.7%). Smoking rates also varied by career length, with the lowest prevalence among dentists who had worked 10 to 20 years (1.3%) and the highest rate among those who had worked over 40 years (6.7%). Overall, our study suggests that the prevalence of smoking is rather low among Queensland dentists. As the distribution of smoking was not uniform however, future preventive measures will need to consider the individual situation of dentists who smoke, particularly those in the older age groups.

Introduction

Tobacco smoking represents the single biggest preventable cause of death in the world today. It claims around 5 million lives per year, a figure that expected to rise to 10 million by the year 2020 [World Health Organization Website, http://www.wpro.who.int.htm]. Roughly 20% of Australians currently smoke, although the prevalence among women has been declining in recent years. According to the World Health Organization, Australian physicians also have one of the world's lowest smoking rates, approximately 2% among females and 4% among males [World Health Organization Website, http://www.who.int/tobacco/en/atlas5.pdf]. The prevalence among Australian dentists is however, unknown. This is unfortunate, as dentists hold an important position as community role models with regard to appropriate health behaviors. Helping their patients to quit smoking is an important example, as there is evidence linking the relationship between a dentist's own smoking habits and their desire to help patients quit smoking. As fewer dentists smoke, an increasing proportion will be inclined to promote nonsmoking [1]. Smoking is also a significant cause of many oral diseases that dentists will regularly encounter during their practice, such as halitosis, gingivitis and oral cancers. Reducing community smoking levels therefore has the added bonus of reducing overall dental morbidity.

Despite this fact, dentists and doctors have not always had a positive history with regard to appropriate health behaviors, such as tobacco smoking. In the early 1950s for example, around half of all physicians smoked [2]. A survey conducted in 1967 revealed that around one-third of American dentists were

smokers, a figure which had fallen to 23% by 1975 [2,3]. By the 1980s further progress had been made in reducing tobacco consumption, with the prevalence of smoking among American dentists falling to 8% [4]. Even more encouragingly, a study from Thailand conducted in 2001 found that less than 3% of dentists smoked [5]. Surprisingly, the prevalence of smoking among dentists in general and Australian dentists in particular, has not been well studied. Although the World Health Organization suggests that between 3% and 61% of male physicians smoke tobacco [World Health Organization Website, http://www.who.int/tobacco/en/atlas5.pdf], no figures are provided for dentists. Furthermore, few if any researchers have investigated smoking among a cross-section of Australian dentists. Given these inconsistencies, we considered it necessary to investigate the epidemiology of tobacco smoking among a cross-section of dentists in Queensland, Australia.

Methods

This study utilized a self-reporting postal questionnaire which was administered to a complete cross-section of dentists in Queensland, Australia. Ethical approval was obtained from the James Cook University Human Ethics Sub-Committee in 2003. Our questionnaire was adapted from other investigations of tobacco smoking conducted among dentists and doctors in various countries [1-17]. It consisted of a simple tick-box format, with questions focusing on current status and previous history of tobacco smoking, as well as basic demographic items such as age, weekly working hours and career length. We then obtained a random sample of 400 members registered with the Queensland Branch of the Australian Dental Association, from which a series of postal labels with

random identification numbers were generated in 2004. Each dentist was sent a cover sheet explaining the purpose of the survey and how to complete the form, a blank questionnaire (which included the ID number) and a postage-paid return envelope. The questionnaire itself was anonymous, and the participants were asked not to include their name or any other form of identification. Our study was preempted by a notice in the ADA Queensland Branch Newsletter advising dentists about the pending survey. There were no penalties or rewards for participation and informed consent was implied if the anonymous questionnaires were completed and returned. As each questionnaire was returned, the ID number was noted. ID numbers which were not returned were then forwarded to the dental association. From this list, one reminder was sent to dentists who had not returned their questionnaires after the initial mailing. Data was entered into a spreadsheet program and analyzed by statistical software. Basic statistics were calculated, with smoking prevalence rates calculated by gender, and stratified by age range, weekly working hours and career length. Computed 95% Confidence Intervals (95%CI) were calculated for smoking prevalence rates, with mean values displayed for age, weekly working hours and career length.

Results

We obtained completed questionnaires from 281 of 400 registered dentists, with 10 questionnaires undeliverable and marked 'return-to-sender'. The overall response rate was therefore: 281 / 390 = 72.1%. Of the respondents, 73% were male and 27% female, with an average age of 45 years. They worked an average of 36 hours per week, with and overall career duration of 21 years. As

shown in Table 1, the prevalence of current smoking was 3.9% (95%CI 2.2 – 6.9), with a further 11.0% being ex-smokers (95%CI 7.9 – 15.2). There was only 1 female smoker when stratified by gender, thereby increasing the prevalence rate among males to 4.9% (2.7 – 8.7). As shown in Table 2, smoking rates varied by age, with 6.1% of dentists aged younger than 30 years who were smokers. The lowest smoking prevalence was seen among dentists aged between 30 and 40 years (1.4%), and the highest among those aged over 60 years (7.1%). Fig. 1 shows the prevalence of smoking with regard to weekly work hours. The highest smoking prevalence was seen among dentists who worked between 25 and 35 hrs per week (6.8%). Ex-smokers were more likely to work less than 25 hrs per week (21.7%). The dentist's average age varied with respect to hours worked per week, with the average age of dentists working less than 25 hrs per week being 51 years. Conversely, the average of dentists working over 55 hours per week was 41 years. Smoking rates varied by career length, with the lowest prevalence among dentists who had worked 10 to 20 years (1.3%) and the highest rate among those who had worked over 40 years (6.7%). A similar pattern was revealed for ex-smokers in Fig. 2, with prevalence rates of 1.7% and 33.3%, respectively. A comparison between smoking rates among the dentists in this study, and the results from other international researchers are displayed in Table 3.

Discussion

The overall smoking prevalence among Queensland dentists was around 4%, which is considerably lower than previous studies conducted in the United States 8% [4] to 23% [7]. It was also lower than that reported in an earlier study

of Victorian dentists (6%) [17], but higher than an investigation from Thailand (2%) [5]. The confidence interval for our prevalence rate however, ranged from around 2% to 7%, which is similar to the result obtained during other studies of dentists mentioned above [4,5,17]. Nevertheless, as few other researchers have documented smoking among dentists generally, there is limited data with which to compare our results. One reasonably comparable group is medical doctors, who might be expected to share similar demographic characteristics with their dental colleagues. The prevalence of smoking among physicians seems to vary widely depending on country of origin, with rates ranging from 5% in the United Kingdom [13] and New Zealand [12] to 38% in the Netherlands [8]. When stratified by gender, we found that there was only one female smoker, which is similar to some investigations of doctors in Malaysia [14] and Hong Kong [15], and also a study of Thai dentists [5], where no females smoked at all. Roughly 5% of male dentists in Queensland were smokers, which is lower than that reported by doctors in an American study (10%) [16], but similar to an investigation from Hong Kong (7%) [15].

When compared to population data from the World Health Organization [World Health Organization Website (Accessed in July 2005), http://www.who.int/tobacco/media/en/Australia.pdf], it appears that Queensland dentists smoke tobacco at about one-fifth of the community rate among Australians (20%) This finding is important, as it suggests that dentists can take an active role in helping their patients to quit smoking, a practice that is encouraged for Australian dentists [18]. Nevertheless, it is interesting to consider why smoking rates among dentists and doctors differ from that of the

community in which they live. Previous research has suggested that physicians at least, tend to give up smoking before the general population for a few reasons. Doctors probably understand the negative medical consequences more quickly, their devotion to health conflicts naturally with unhealthy behaviors, and finally, because smoking usually incurs a negative image in health care long before it does so in the community [19]. Given their major similarities with physicians, it is reasonable to assume that dentists would also be affected in a similar manner.

The highest rates of smoking and ex-smokers were reported among the older dentists, which is similar to previous research conducted among physicians in France [9] and the Netherlands [8]. Another investigation of American physicians also revealed higher smoking rates occurred among those aged between 50 and 69 years of age [16]. There were few smokers aged younger than 30 years, which is similar to a previous study of physicians' smoking in New Zealand [12]. It seems therefore, that there is a tendency for smoking rates to decrease over time among medical personnel due to a generational effect, as the social climate of a country changes and more people give up smoking [8,9,11]. This phenomena is also reflected in the higher rates of smokers and ex-smokers who had been practicing dentistry for over 30 years. Older dentists will tend to have worked for longer, and thus, their smoking rates should be higher when compared to their less experienced and younger colleagues. The relationship between smoking rates and weekly working hours during our study was novel, with the highest proportion of ex-smokers working less than 25 hrs per week. This may reflect older dentists with a higher proportion of ex-smokers,

being the most likely to be semi-retired and working shorter hours. The finding that average age was higher among dentists working less than 25 hrs per week seems to support such a hypothesis. On the other hand it may simply be a statistical artifact which will need to be clarified in future, large scale studies of Australian dentists.

Although this study benefited from an encouragingly high response rate, there may have been a selection bias where current smokers were unwilling to return their questionnaire. With a response rate of 72%, there were presumably 109 dentists who did not return the questionnaire. If all of them were smokers (a highly unlikely scenario) the maximum smoking rate would have been much higher, around 31%. On the other hand, if there were no smokers among the non-respondents, the prevalence rate would be closer to 3%. Although we could not determine exactly why the non-responders did not respond, we are confident that smoking habits themselves were probably not the reason. With this in mind, we were careful to use many strategies which have previously been shown to improve response rates and obtain a more representative sample during postal surveys [23]. These strategies included the use of a short questionnaire, the use of an anonymous questionnaire, one which covered a topic of interest to the participants and the fact that our study clearly originated from a university rather than a commercial enterprise. As such, we anticipate that the sample was representative of Queensland dentists generally, and that a high proportion of smokers should not have been concentrated in the non-respondents group. Nevertheless, future longitudinal research should now be

conducted among dentists in Queensland as elsewhere, to help clarify some of the emerging issues uncovered during our study.

Conclusion

Overall, this investigation suggests that the prevalence of smoking is probably quite low among Queensland dentists. Although smoking remains an important health issue among them, the distribution of smoking does not appear to be uniform, with a high proportion of smokers being concentrated in the older age groups. As such, future preventive measures will need to consider the individual situation of dentists who smoke, particularly those who are older and less likely to quit their habit.

References

1. O'Shea RM, Corah NL. The dentist's role in cessation of cigarette smoking. *Public Health Rep* 1984; 99: 510-514.

2. Garfinkel L, Stellman SD. Cigarette smoking among physicians, dentists and nurses. *CA Cancer J Clin* 1986; 36: 2-8.

3. Noll CE. Health Professionals and the Problems of Smoking and Health. Report No. 2: *Dentists' behavior, beliefs and attitudes toward smoking and health.* Report on the NORC Survey 4001. Chicago, University of Chicago, National Opinion Research Centre, 1969.

4. Christen AG. Survey of smoking behavior and attitudes of 630 American dentists: Current trends. *J Am Dent Assoc* 1984; 109: 271-272.

5. Leggat PA, Chowanadisai S, Kedj*arune U, Kukiattrakoon B, Yapong B. Health of dentists in southern Thailand.* Int Dent J 2001; 51: 348-352.

6. Garfinkel L. Cigarette smoking among physicians and other health professionals, 1959-1972. *CA Cancer J Clin* 1976 26: 373-375.

7. Stellman SD, Boffetta P, Garfinkel L. Smoking habits of 800 000 American men and women in relation to their occupations. *Am J Ind Med* 1988; 13: 43-58.

8. Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. S*oc Sci Med* 1993; 36: 817-822.

9. Tessier JF, René L, Nejjari C, et al. Attitudes and opinions of French general practitioners towards tobacco. *Tob Control* 1993; 2: 226-230.

10. Zanetti F, Gambi A, Bergamaschi A, et al. Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health* 1998; 112: 57-62.

11. Smith DR, Wei N, Zhang YJ, Wang RS. Tobacco smoking habits among a cross-section of rural physicians in Mainland China. *Aust J Rural Health* 2006; 14: 66-71.

12. Hay DR. Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. *NZ Med J* 1998; 111: 102-104.

13. Hussain SF, Tjeder-Burton S, Campbell IA, Davies PDO. Attitudes to smoking and smoking habits among hospital staff. *Thorax* 1993; 48: 174-175.

14. Yaacob I, Abdullah ZA. Smoking habits and attitudes among doctors in a Malaysian hospital. *Southeast Asian J Trop Med Public Health* 1993; 24: 28-31.

15. Cheng KK, Lam TH. Smoking among young doctors in Hong Kong: A message to medical educators. *Med Educ* 1990; 24: 158-163.

16. Hensrud DD, Sprafka JM. The smoking habits of Minnesota physicians. *Am J Pub Health* 1993; 83: 415-417.

17. Mullins R. Attitudes and smoking habits of dentists in Victoria: 16 years on. *Aust Dent J* 1994; 39: 324-326.

18. Trotter L, Worcester P. Training for dentists in smoking cessation intervention. *Aust Dent J* 2003; 48: 183-189.

19. Davis RM. When doctors smoke. *Tob Control* 1993; 2: 187-188.

20. McCartan BE, Sadlier D, O'Mullane DM. Smoking habits and attitudes of Irish dentists and dental students. *J Ir Dent Assoc* 1993; 39: 26-29.

21. Telivuo M, Vehkalahti M, Lahtinen A, Murtomaa H. Finnish dentists as tobacco counselors. *Community Dent Oral Epidemiol* 1991; 19:221-224.

22. Lund M, Lund KE, Rise J. Preventing tobacco use in Norwegian dental practice. *Community Dent Oral Epidemiol* 2004; 32:385-394.

23. Edwards P, Roberts I, Clarke M, DiGuiseppi C, Pratap S, Wentz R, Kwan I. Increasing response rates to postal questionnaires: Systematic review. *Br Med J* 2002; 324: 1183-1185.

Table 1 Smoking Prevalence among Dentists

	%	(95% CI) [a]
All Dentists		
Never Smoked	85.1	(80.4 – 88.7)
Current Smoker	3.9	(2.2 – 6.9)
Previous Smoker	11.0	(7.9 – 15.2)
Males Only		
Never Smoked	80.1	(74.1 – 85.0)
Current Smoker	4.9	(2.7 – 8.7)
Previous Smoker	15.0	(10.8 – 20.6)
Mean Values		
Dentists' Age	45.0 Years	
Weekly Work	36.0 Hours	
Career Length	21.0 Years	

[a] Computed 95% Confidence Intervals for prevalence rates

Table 2 Smoking Prevalence among Dentists by Age Range

	<30 Yrs		30-40 Yrs		40-50 Yrs		50-60 Yrs		>60 Yrs	
Smoking Status	**n**	**(%)[a]**	**n**	**(%)[a]**	**n**	**(%)[a]**	**n**	**(%)[a]**	**n**	**(%)[a]**
Current Smoker	2	(6.1)	1	(1.4)	3	(3.5)	3	(5.1)	2	(7.1)
Ex-Smoker	0	(0.0)	4	(5.6)	12	(13.8)	5	(8.5)	10	(35.7)
Proportion b	33	(11.8)	72	(25.8)	87	(31.2)	59	(21.2)	28	(10.0)

[a] Prevalence of smoking or ex-smoking in each subgroup

[b] Proportion of all dentists in each subgroup

Figure 1 Smoking Prevalence among Dentists by Weekly Working Hours

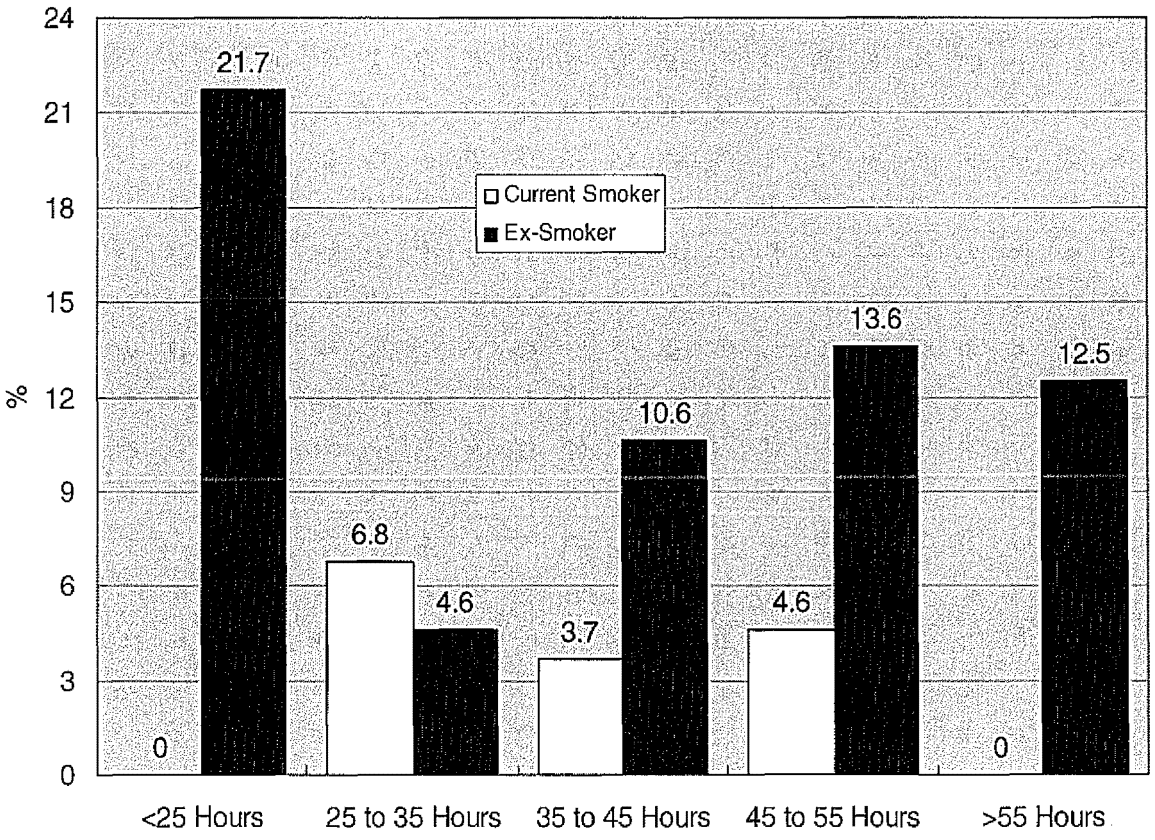

Figure 2 Smoking Prevalence among Dentists by Career Length

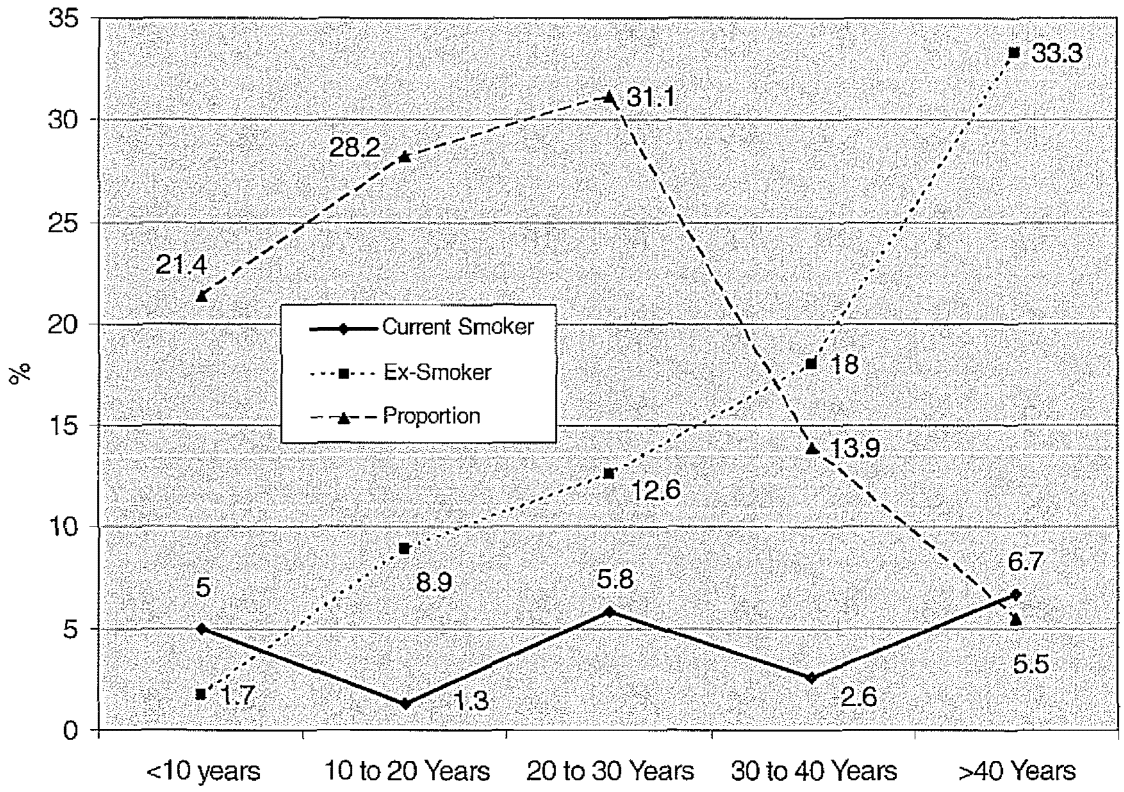

Table 3 Smoking Rates among Dentists and Doctors

	Rate [a]	Year	Reference [b]
Dentists			
United States	23%	1988	[7]
Ireland	14%	1993	[20]
Finland	6-25%	1991	[21]
Norway	7%	2004	[22]
Australia	6%	1994	[17]
Thailand	2%	2001	[5]
Doctors			
Netherlands	38%	1993	[8]
France	32%	1993	[9]
Italy	31%	1998	[10]
China	16%	2005	[11]
United Kingdom	5%	1993	[13]
New Zealand	5%	1998	[12]
Australia	4%	2005	c

[a] Prevalence rates rounded to the nearest whole number,

[b] Reference number as listed in this manuscript,

[c] The current study

Part 2

Tobacco Smoking among Doctors

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Tobacco Smoking Habits among a Cross-Section of Rural Physicians in China

ABSTRACT

Objective: To investigate the prevalence and distribution of tobacco smoking among rural Chinese physicians. *Design:* A self-reporting survey adapted from previous international studies. *Setting:* A teaching hospital in Hebei Province, Mainland China. Subjects: A complete cross-section of 361 physicians working in all hospital departments. *Results:* The overall response rate was 79.2%, among whom 15.7% (95%CI 12.0 – 20.4) were current smokers and 1.0% ex-smokers (95%CI 0.4 – 3.1). There were no female smokers when stratified by gender, although the prevalence rate among male physicians was 31.9% (24.8 – 40.0). The prevalence of smoking varied widely by hospital department, ranging from zero in the obstetrics and gynecology department, to 32.6% in the surgical unit. Smoking rates also varied by age, with physicians younger than 25 years having the lowest prevalence (6.3%). Although they only accounted for 7.1% of the entire group by number, the highest smoking prevalence was seen among physicians aged 50 to 54 years (31.6%). *Conclusions:* Although our study suggests that smoking is an important health issue for rural Chinese physicians, the distribution of risk is not uniform. Future preventive measures will therefore need to consider the individual situation of physicians who smoke, particularly those in the older age groups.

Introduction

Mainland China is currently the worlds' largest tobacco user,[1] consuming around 1643 billion cigarettes per year.[2] One-third of all cigarettes smoked in the world are smoked in China and the community prevalence rate is very high, at approximately 67% for men and 4% for women.[2] China's smoking epidemic is also changing for the worse, with men and women smoking at younger ages and consuming more cigarettes per day, than ever before.[3] Tobacco smoking has now become a major cause of death among Chinese. In 1994 for example it was causing around 12% of all male mortality in middle age,[4] and by 1997 this proportion had risen to 20%.[5] By the year 2025, it is predicted that approximately 2 million smoking-related deaths will occur.[1] At the current rates around one in four smokers will be killed by their habit,[6] and about half of the 300 million smokers in China today will eventually die from tobacco-related diseases.[7] Intervention strategies may not be very successful either, with current research suggesting that almost three-quarters of Chinese smokers have no intention to quit.[8]

As major health-care providers, physicians are usually at the forefront of preventive medicine programs, both as primary care providers and as role-models for appropriate health-related behavior. Despite this fact, physicians do not always have a positive history with regard to tobacco smoking. In the early half of last century for example, physicians not only smoked at high rates, but they even appeared in tobacco advertising campaigns.[9] Since that time however, significant progress has been made in reducing tobacco consumption among them, with current rates as low as 5% in some countries.[10,11]

Nevertheless, there are many good reasons for investigating tobacco smoking among physicians. Firstly, the potential success of any future anti-smoking campaigns in the community can be gauged by the prevalence of smoking among doctors.[9] If a high proportion of public-health role models smoke tobacco for example, it would be very difficult to convince the public to give up. Secondly, it has also been suggested the 'maturity' of a smoking epidemic in a particular country may be predicted by the smoking rate among physicians. This usually occurs because the medical profession tends to give up smoking earlier than the general population.[9]

Despite a high community prevalence rate and its potentially catastrophic mortality, smoking among rural Chinese physicians has not been well studied. Although the World Health Organization currently lists the prevalence rate for medical doctors at around 61% for males and 12% for females,[2] no studies appear to have been conducted in rural areas. Furthermore, few investigations have investigated smoking among a cross-section of physicians, even though the prevalence of smoking among physicians is known to vary across different medical specialties.[12] Given these inconsistencies, we considered it necessary to investigate the epidemiology of tobacco smoking among a complete cross-section of physicians within a rural Chinese hospital.

Methods

This study utilized a self-reporting questionnaire which was administered to a complete cross-section of physicians from a rural area in Hebei Province, approximately 280 km south-west of Beijing. Our questionnaire was adapted

from other investigations of tobacco smoking conducted among physicians in various countries.[10-19, 21-23] It consisted of a simple tick-box format, with questions focusing on current status and previous history of tobacco smoking, as well as basic demographic items such as age, gender, total employment duration and medical specialty. We also asked the number of cigarettes smoked per day and the total duration of smoking, so that a Brinkman Index of tobacco smoking severity could be established.[20] Questionnaires were distributed by senior medical staff and collected within a 1-week period during late 2004. There were no penalties or rewards for participation and informed consent was implied if questionnaires were completed and returned. Data was entered into a spreadsheet program before being analyzed by statistical software. Basic statistics were calculated, with smoking prevalence rates calculated by gender, and stratified by hospital department, age range and career length. Computed 95% Confidence Intervals (95%CI) were calculated for smoking prevalence rates, using statistical software. Figures for smoking duration and severity were calculated as percentages of each subgroup, because not all physicians answered each question.

Results

We obtained completed questionnaires from 286 of 361 physicians, giving an overall response rate of 79.2%. The overall prevalence of smoking was 15.7% (95%CI 12.0 – 20.4), with a further 1.0% being ex-smokers (95%CI 0.4 – 3.1), as indicated in Table 1. There were no female smokers when stratified by gender, although the prevalence rate among male physicians was 31.9% (24.8 – 40.0). Of those who smoked, the median number was 10 cigarettes per day

for a period of 12.5 years. When categorized by the Brinkman Index, 51.4% were light smokers and 40.5% were moderate smokers. The prevalence of smoking varied widely by department, ranging from 5.1% in internal medicine to 32.6% in the surgical unit. Refer to Figure 1. There were no smokers in the obstetrics and gynecology department. Smoking rates also varied by age, with physicians younger than 25 years having the lowest prevalence (6.3%). Although they only accounted for 7.1% of the entire group by number, the highest smoking prevalence was seen among physicians aged 50 to 54 years (31.6%). As shown in Figure 2, a similar trend was demonstrated among physicians aged over 55 years, who accounted for 11.9% of all smokers and had a smoking prevalence of 29.4%. Almost one-third (28.0%) of all physicians who had worked 21 to 25 years were smokers, even though they accounted for only 8.8% of all physicians, by number. The lowest smoking rates were reported by those who had worked for less than 2 years (7.4%), as shown in Figure 3.

Discussion

The overall smoking prevalence among our Chinese physicians was around 16%, which is lower than other investigations conducted in the Netherlands (38%),[12] France (32%)[13] and Italy (31%),[14] but higher than research from the United States (9%),[15] New Zealand (5%)[10] and the United Kingdom (5%).[11] Interestingly, it was very similar to the smoking prevalence previously recorded among Malaysian physicians (18%).[16] When stratified by gender, we found that there were no female smokers at all, which is similar to other Asian investigations from Malaysia16 and Hong Kong.[17] Around one-third (32%) of the male physicians in our study were smokers, which is slightly higher than

research conducted in Italy (29%),[14] Japan (27%),[18] Estonia (25%)[23] and France (22%).[13] Other evidence suggests that male physicians from the Netherlands[12] may smoke at higher rates than their Chinese counterparts (41% verses 32%). When compared to population data from the World Health Organization (WHO), it appears that Chinese physicians smoke tobacco at about half the community rate (67% in men, 4% in women and 36% overall).[2]

The highest smoking rates were seen in the older age groups, which is similar to previous research conducted in Japan,[18] France[13] and the Netherlands.[12] An American investigation also found that the highest smoking rates were documented among physicians aged between 50 and 69 years of age.[15] There were no smokers aged younger than 25 years, which is similar to a previous study of physicians' smoking in New Zealand.[10] It can be seen therefore, that there is a tendency for smoking rates among physicians to decrease over time,[13] probably due to a 'generational effect' as the social climate of a country changes with respect to tobacco.[12] The median number of cigarettes smoked per day was 10, which is slightly lower than the Chinese national average (10 for women and 15 for men),[3] and a previous investigation conducted in France (11 for women and 15 for men).[13] It was however, higher than a study of Dutch physicians, where general practitioners smoked an average of 62 cigarettes per week.[12]

Nevertheless, it is interesting to contemplate why smoking rates among physicians differ from that of the community in which they live. In this regard, previous research has shown that physicians tend to give up smoking before

the general population for three main reasons. Firstly, physicians probably get the 'medical' message more quickly. Secondly, their devotion to health-care conflicts strongly with unhealthy behaviors such as smoking; and thirdly, because smoking usually gains a negative image in the medical profession long before it does so in the wider community.[9] As such, the smoking rate among physicians can be seen to reflect the maturity of a smoking epidemic in a particular country. In this regard, an epidemic can be seen to be 'mature' when the rate among physicians falls below that of the community.[9] In the United States for example, tobacco smoking among physicians declined from about 30% in the 1960s, to 20% in the 1970s and then to about 10% in the 1990s.[15] Rates in other Western countries such as the United Kingdom, New Zealand and Australia may be even lower.[10,11] Smoking rates among European physicians have also shown a downward trend in recent years.[13] This trend has not been uniform across all developed countries, however.

For example, it appears that around 27% of Japanese physicians still smoke tobacco, at a rate roughly half that of the general population in which they live.[18] Why one-third of male Chinese physicians continue to smoke is difficult to understand. It is possible that Chinese physicians do not see themselves as role models for healthy behavior in the community. A previous study by Ohida et al[18] suggested that this may be the case among their Japanese counterparts and may help explain the relatively high smoking rates among Japanese physicians. On the other hand, Chinese physicians may lack knowledge on the relationship between smoking and lung cancer. Geographical factors are also worth considering, as regional variations in smoking rates have previously been

demonstrated in China, particularly among women.[1] This suggests that there may be intrinsic differences in the medical demographic of rural and metropolitan areas, with regard to smoking. National surveys of tobacco smoking habits among Chinese physicians from a wide geographical cross-section will therefore be needed to elucidate the complicity of rurality on tobacco use. Whatever the reason for their high smoking rates, it is essential that the medical profession actively promotes quit-smoking campaigns for their patients, and for themselves. A focused and sustained anti-smoking campaign promoted by the Chinese medical association and the central government may also be useful in controlling this current epidemic.

Conclusion

Overall, our study suggests that tobacco smoking is reasonably common among rural Chinese physicians, occurring at a rate about half that of the general population. Although this implies that smoking is an important health issue for Chinese physicians, the distribution of risk is not uniform, with a high proportion of smokers being concentrated in the older age groups. As such, future preventive measures will need to consider the individual situation of rural physicians who smoke, particularly those who are older and less likely to quit their habit.

References

1 Yang G, Fan L, Tan J, et al. Smoking in China: Findings of the 1996 National Prevalence Survey. *Journal of the American Medical Association* 1999; 282: 1247-1253.

2 *World Health Organization.* http://www.who.int

3 Mackay J. Beyond the clouds – Tobacco smoking in China. *Journal of the American Medical Association* 1997; 278: 1531-1532.

4 Niu SR, Yang GH, Chen ZM, et al. Emerging tobacco hazards in China: 2. Early mortality results from a prospective study. *British Medical Journal* 1998; 317: 1423-1424.

5 Chen ZM, Xu Z, Collins R, Li WX, Peto R. Early health effects of the emerging tobacco epidemic in China. *Journal of the American Medical Association* 1997; 278: 1500-1504.

6 Liu BQ, Peto R, Chen ZM, et al. Emerging tobacco hazards in China: 1. Retrospective proportional mortality study of 1 million deaths. *British Medical Journal* 1998; 317: 1411-1422.

7 Lam TH, He Y, Li LS, et al. Mortality attributable to cigarette smoking in China. *Journal of the American Medical Association* 1997; 278: 1505-1508.

8 Yang G, Ma J, Chen A, et al. Smoking cessation in China: Findings from the 1996 National Prevalence Survey. *Tobacco Control* 2001; 10: 170-174.

9 Davis RM. When doctors smoke. *Tobacco Control* 1993; 2: 187-188.

10 Hay DR. Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. *New Zealand Medical Journal* 1998; 111: 102-104.

11 Hussain SF, Tjeder-Burton S, Campbell IA, Davies PD. Attitudes to smoking and smoking habits among hospital staff. *Thorax* 1993; 48: 174-175.

12 Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. *Social Science and Medicine* 1993; 36: 817-822.

13 Tessier JF, René L, Nejjari C, et al. Attitudes and opinions of French general practitioners towards tobacco. *Tobacco Control* 1993; 2: 226-230.

14 Zanetti F, Gambi A, Bergamaschi A, et al. Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health* 1998; 112: 57-62.

15 Hensrud DD, Sprafka JM. The smoking habits of Minnesota physicians. *American Journal of Public Health* 1993; 83: 415-417.

16 Yaacob I, Abdullah ZA. Smoking habits and attitudes among doctors in a Malaysian hospital. *Southeast Asian Journal of Tropical Medicine and Public Health* 1993; 24: 28-31.

17 Cheng KK, Lam TH. Smoking among young doctors in Hong Kong: A message to medical educators. *Medical Education* 1990; 24: 158-163.

18 Ohida T, Sakurai H, Mochizuki Y, et al. Smoking prevalence and attitudes toward smoking among Japanese physicians. *Journal of the American Medical Association* 2001; 285: 2643-2648.

19 Young JM, Ward JE. Declining rates of smoking among medical practitioners. *Medical Journal of Australia* 1997; 167: 232.

20 Brinkman GL, Coates EO. The effect of bronchitis, smoking and occupation on ventilation. *American Review of Respiratory Diseases* 1963; 87: 684-693.

21 Bener A, Gomes J, Anderson JAD. Smoking habits among physicians in two gulf countries. *Journal of the Royal Society of Health* 1993; 113: 298-301.

22 Kawahara K, Ohida T, Osaki Y, et al. Study of the smoking behavior of medical doctors in Fukui, Japan and their antismoking measures. *Journal of Epidemiology* 2000; 10: 157-162.

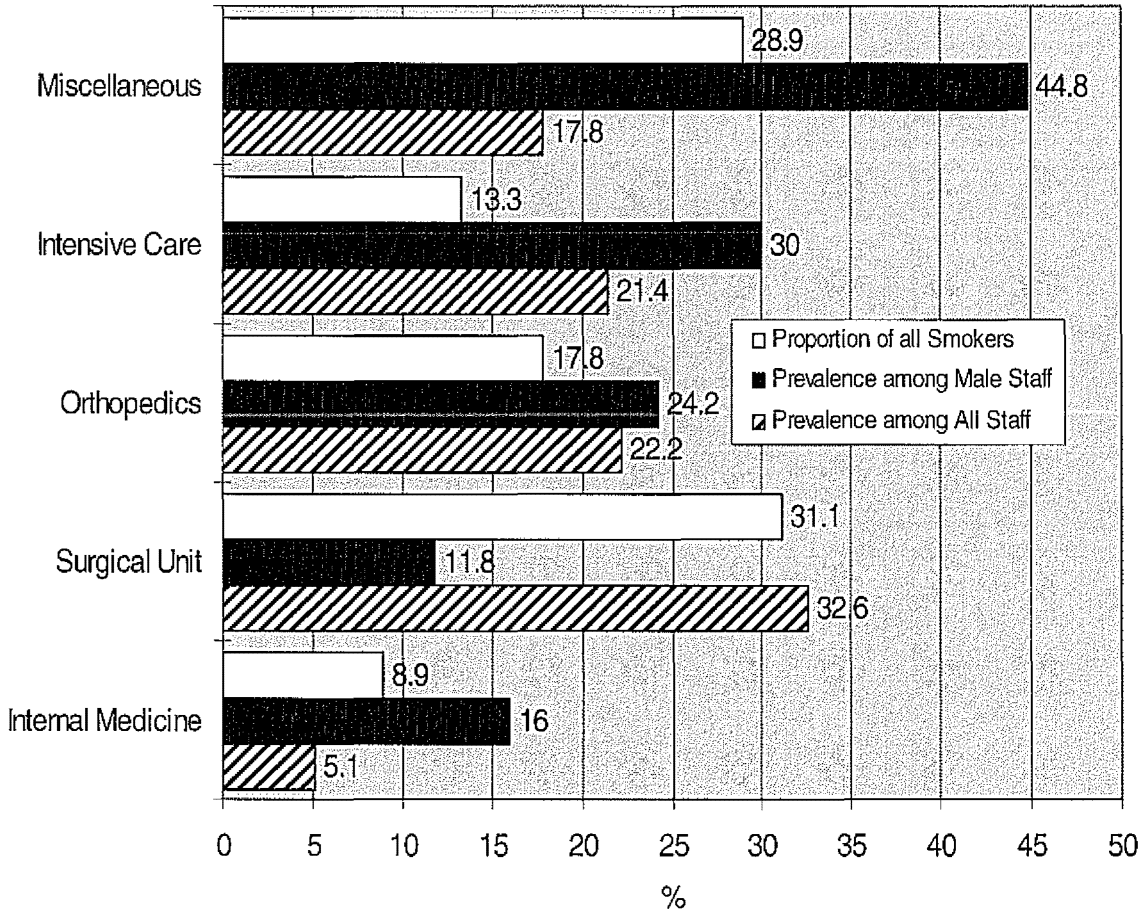
23 Parna K, Rahu K, Rahu M. Smoking habits and attitudes towards smoking among Estonian physicians. *Public Health* 2005; 119: 390-399.

Table 1 Smoking Prevalence, Frequency and Duration among Chinese Physicians

	%	(95% CI) [a]		n	(%) [b]
All Physicians			**Smoking Rate**		
Never Smoked	83.2	(78.5 – 87.1)	<5 per Day	13	(30.2)
Current Smoker	15.7	(12.0 – 20.4)	5-15 per Day	18	(41.9)
Previous Smoker	1.0	(0.4 – 3.1)	>15 per Day	12	(27.9)
Males Only			**Smoking Duration**		
Never Smoked	65.9	(57.8 – 73.3)	<10 years	11	(28.9)
Current Smoker	31.9	(24.8 – 40.0)	10-20 years	21	(55.3)
Previous Smoker	2.1	(0.8 – 6.1)	>20 Years	6	(15.8)
Median Values			**Brinkman Index** [c]		
Smoking Rate	10.0 Smokes / Day		Light Smoker	19	(51.4)
Smoking Duration	12.5 Years Smoking		Moderate Smoker	15	(40.5)
Quit Smoking	7.4 Years Ago		Heavy Smoker	3	(8.1)

[a] Computed 95% Confidence Intervals for prevalence rates, [b] Percentages calculated as a proportion of physicians who answered each question, [c] Adapted from Brinkman et al[20]

Figure 1 Smoking Prevalence Rate among Physicians by Hospital Department



(There were no tobacco smokers in the Obstetrics and Gynecology department)

Figure 2 Smoking Prevalence among Chinese Physicians by Age Range

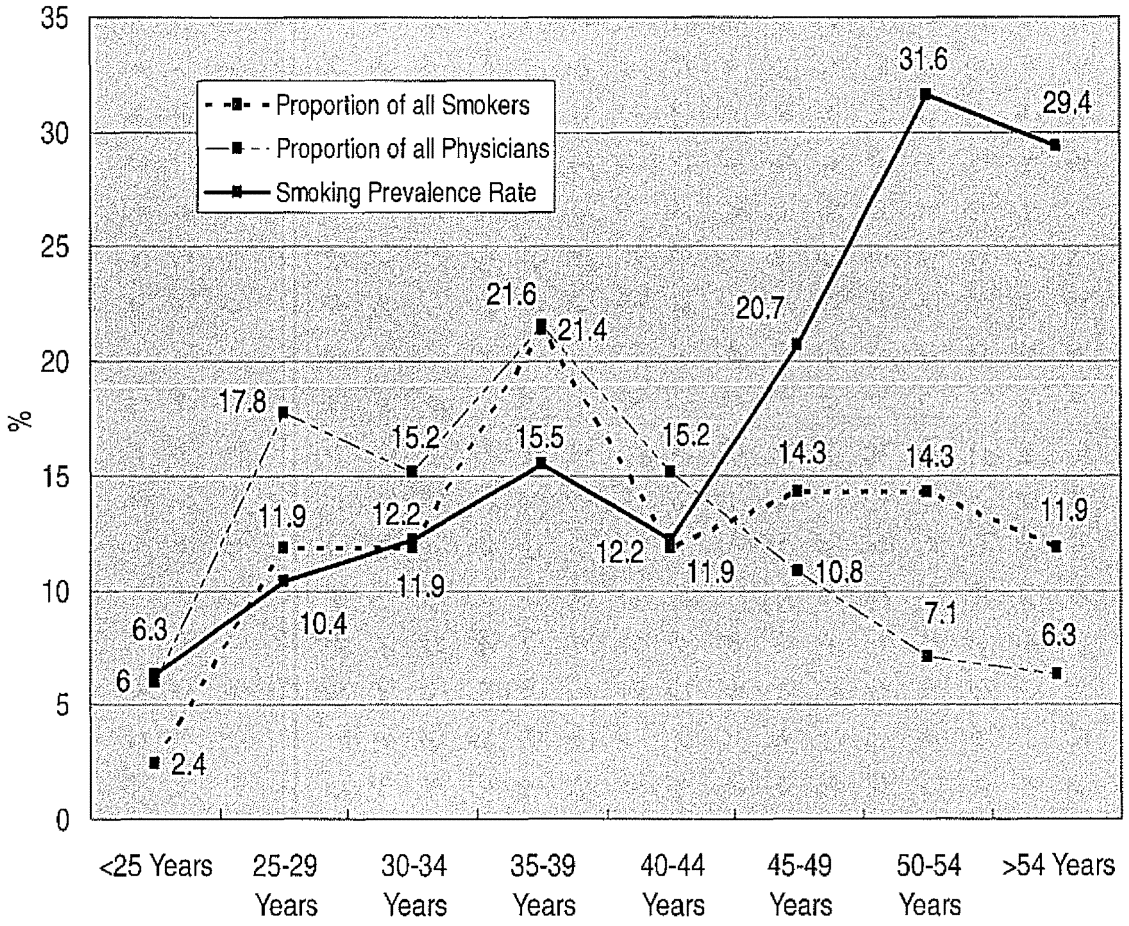


Figure 3 Smoking Prevalence among Chinese Physicians by Career Length

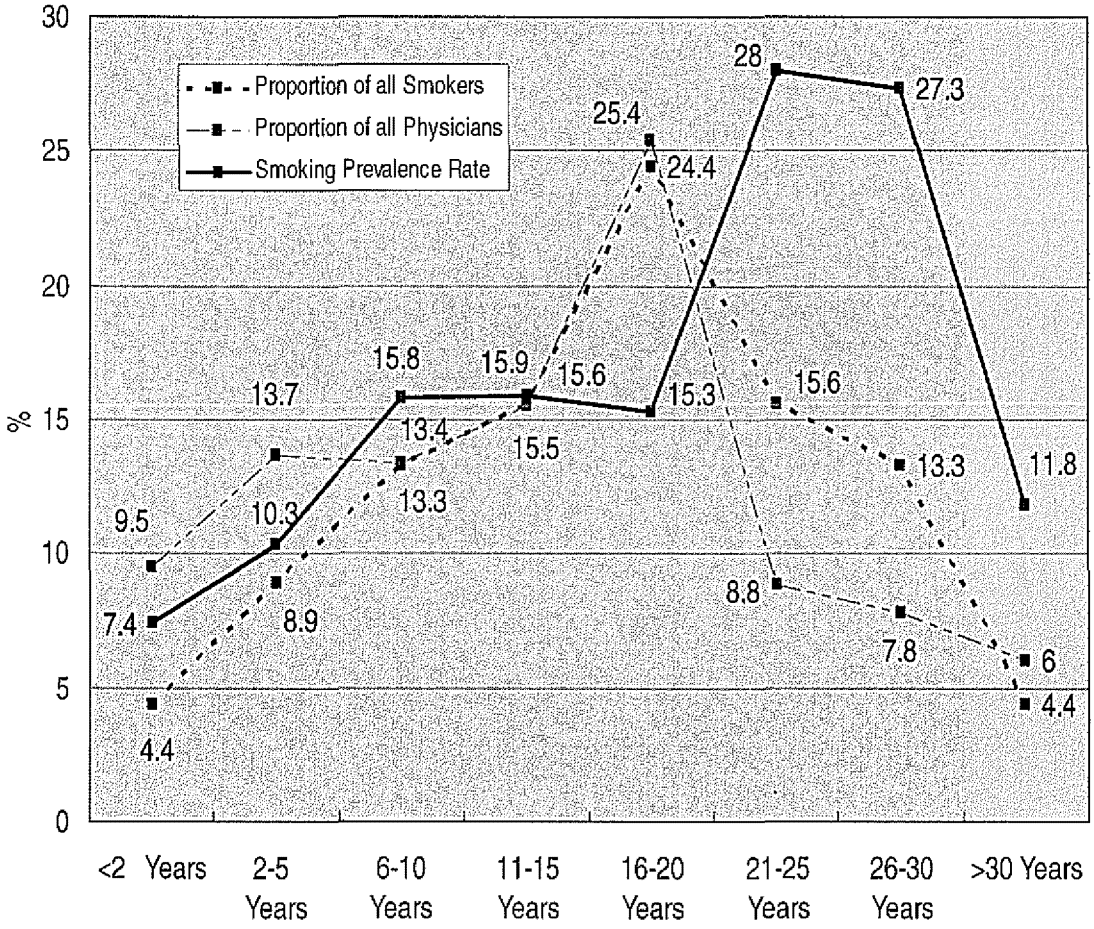


Table 2 International Comparison of Physicians' Smoking Prevalence

	Prevalence Rate [a]			Study Details		
Country	**All**	**Male**	**Female**	**Author**	**Year**	**Rural [b]**
Netherlands[12]	38%	41%	24%	Dekker	1993	N
Kuwait[21]	38%	45%	16%	Bener	1993	N
France[13]	32%	22%	14%	Tessier	1993	N
Italy[14]	31%	29%	34%	Zanetti	1998	N
Japan[22]	26%	28%	5%	Kawahara	2000	Y
Malaysia[16]	18%	25%	0%	Yaacob	1993	N
United States[15]	9%	10%	2%	Hensrud	1993	N
Hong Kong[17]	5%	7%	0%	Cheng	1990	N
New Zealand[10]	5%	5%	5%	Hay	1998	N
Australia[19]	3%	4%	2%	Young	1997	N
China [c]	16%	32%	0%	Smith	2005	Y

[a] Prevalence rates rounded to the nearest whole number, [b] Whether the subjects worked in a rural or metropolitan area, [c] The current study

Part 3

Tobacco Smoking among Nurses

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Contemporary Smoking Habits among Nurses in Mainland China

ABSTRACT

Although China is the world's largest consumer of tobacco and tobacco-related products, the epidemiology of smoking not been well studied among nurses. Given this serious gap in the literature, we considered it necessary to investigate tobacco smoking habits among a large cross-section of contemporary Chinese nurses, by means of a questionnaire survey. A total 509 replies were obtained from 520 nurses (response rate: 97.9%). The overall prevalence of smoking was 2.6% (95%CI 1.5 – 4.3). When stratified by gender, the prevalence rate among male nurses was 52.2% (33.0 – 70.8). Of those who smoked, the median number was 11 smokes per day for a period of 25.0 years. When categorized by severity, 15.4% were light smokers, 69.2% moderate smokers and 15.4% heavy smokers. When stratified by age there were no smokers under 25 years, with the prevalence between 25 and 34 years similarly low, at 1.1%. Although this study suggests that tobacco smoking is relatively uncommon among Chinese nurses overall, the rate among male nurses was alarmingly high. The distribution of smoking habits by age was not uniform however, with a high proportion being concentrated in the older age ranges. As such, future preventive measures will need to consider the individual situation of Chinese nurses who smoke, particularly those who occupy the older age groups.

Introduction

Mainland China is the world's largest user of tobacco and tobacco-related products (Yang et al., 1999), with its citizens smoking around 1643 billion cigarettes per year. One-third of all cigarettes worldwide are smoked in China, and the community prevalence rate is very high, with at least half of all adult males being regular smokers (World Health Organization, 2005). Their epidemic is also changing for the worse, as men and women begin smoking at younger ages and consume greater numbers of cigarettes every day (Mackay, 1997). Tobacco smoking has steadily risen to become a major cause of death among Chinese, causing around 12% of all male mortality in middle age in 1994 (Niu et al., 1998), a figure which had climbed to 20% by 1997 (Chen et al., 1997). If the present trends continue, one-quarter of all Chinese tobacco users will be killed by their habit (Liu et al., 1998), and about half of all current smokers (roughly 300 million people) will eventually die from tobacco-related diseases (Lam et al., 1997). Smoking is also beginning to exert both direct and indirect negative effects on the Chinese economy. For example, economic loss from tobacco-related ill health reached eight billion US dollars in 1993, while a significant environmental cost was also incurred by having to clean up around five billion cigarette butts every day from Chinese streets (Mackay, 1997).

Being at the forefront of health care, nurses occupy an important position as both primary-care providers and as role-models for appropriate health behavior. Their impact should not be underestimated either, as nurses also represent one of the largest professional groups in health care (Adriaanse et al., 1991). Despite this fact, research conducted in the United States between the 1950s

and 1970s revealed that large proportions of nurses were smokers (Garfinkel & Stellman, 1986). Contemporary investigations however, seem to suggest that their overall smoking rate is falling in Western countries such as New Zealand (Hay, 1998), but remains rather high in various parts of the world such as Spain (Torres Lana et al., 2005) and the Balkans (Hodgetts et al., 2004). There has been considerable debate as to why nurses actually smoke (Rowe & Macleod Clark, 2000a; Rowe & Macleod Clark, 2000b), although it appears that a certain proportion of them may take up the habit before working as a nurse (McKenna et al., 2003).

Given the relative ambiguity between negative health behaviors and their role as health professionals, many international studies have investigated the epidemiology of smoking among nurses (Adriaanse et al., 1991). Despite a high community prevalence rate and the fact that nurses may often smoke tobacco, the issue has not been well-studied among Chinese nurses. This represents a major oversight in the literature, as Chinese nurses who are at the forefront of primary health care and who have the most direct patient contact, would be well placed to lead any public health campaigns aimed at reducing tobacco consumption within their community. As they number over one million (Xu et al., 2000), Chinese nurses also represent a large, professional, manpower resource which could be utilized in meeting the current smoking epidemic. Nevertheless, it will be difficult to effectively target tobacco-related interventions if the smoking habits of the health care providers themselves (i.e. nurses) are not clearly understood. Therefore, we considered it necessary to investigate the epidemiology of tobacco usage among a large cross-section of Chinese nurses,

to help better understand which elements of their workforce might be best targeted to lead the fight against tobacco.

Methods

The protocol for this study was initially reviewed and approved by an institutional research ethics committee in Japan. Practical aspects of the data collection methodology were structured to conform to relevant ethical standards appropriate for mainland China. A large cross-section of registered nurses was then recruited from two teaching hospitals (affiliated with the same university) in Shijiazhuang city, Hebei province (approximately 280 km south-west of Beijing). All nurses employed at these facilities, and who were not on leave, were eligible for inclusion within the study. Our investigation utilized an anonymous, self-reporting questionnaire which was primarily adapted from tobacco smoking surveys conducted in various countries (Hussain et al., 1993; Nelson et al., 1994; Hay, 1998; Ohida et al., 1999). We felt that the general nature of questions used by these previous authors would be easy to understand when translated. As such, the English version was carefully translated into Chinese characters by an experienced team of bilingual health professionals, before being back-translated into English and rechecked against the original. The document was then piloted among a small group of professional Chinese nurses to ensure that our use of specific Chinese characters was logistically sound and culturally appropriate; whilst simultaneously capturing the particular smoking data we required. In this regard, the final version was a one-page document consisting of simple questions on current smoking habits, previous smoking, age, gender and total employment duration as a nurse. In order to

establish a relative scale of smoking severity, the number of cigarettes smoked per day and total duration of smoking was also requested, so that a Brinkman Smoking Severity Index could be calculated (Brinkman & Coates, 1963). This index was first utilized in the early 1960s, and has since become a simple and effective tool for identifying the relative severity of tobacco addiction.

To stimulate interest and help prepare nurses who might be unfamiliar with epidemiological research, a lecture was presented by the authors where the study methodology and anonymous, voluntary nature of our survey was described. The survey was then physically distributed to senior nurses, who in turn passed it on to the chief nurse of each ward for distribution to their individual staff members. This method was deemed culturally appropriate in China for two reasons. Firstly, the study itself would gain respect by having originated from international researchers who were affiliated with nursing management. Secondly, the physical distribution of over 500 questionnaires required a certain degree of manpower that, for the aforementioned reasons, should be associated with nursing management. After answering the questions whenever they had time, nurses were requested to fold their surveys in half to ensure privacy. Surveys were subsequently collected by the chief nurse of each ward over a 1-week period. As the folded documents were not opened by anyone except the researchers, and the fact that the questionnaire was anonymous and voluntary, informed consent was implied if questionnaires were completed and returned. Following collection, data was entered into a standard spreadsheet program, before being analyzed by statistical software. Basic statistics were calculated, with computed 95% Confidence Intervals (95%CI)

ascertained for smoking prevalence rates and smoking severity categories. Data was further stratified into seven age ranges and seven career ranges, to help clarify smoking habits by age and career duration.

Results

Our questionnaire was distributed to 520 hospital nurses, from whom 509 replies were obtained (response rate: 97.9%). Ninety-five percent of the respondents were female. Their average age was 33.5 years (Standard Deviation: 9.1 years), average weekly working hours were 42.4 (SD 4.3) and total duration of employment: 12.8 years (SD 9.1). The overall prevalence of smoking was 2.6% (95%CI 1.5 – 4.3). When stratified by gender, the prevalence rate among male nurses was 52.2% (33.0 – 70.8). Of those who smoked, the median number was 11 smokes per day for a period of 25.0 years. When categorized by the Brinkman Index (Brinkman & Coates, 1963), 15.4% were light smokers, 69.2% moderate smokers and 15.4% heavy smokers. Refer to Table 1. When stratified by age, there were no smokers under 25 years, with the prevalence between 25 and 34 years similarly low, at 1.1%. The highest smoking rate was seen among nurses aged 45 to 50 years (10.1%), even though they only comprised 9.8% of the total workforce. Refer to Figure 1. Regarding career length, the lowest smoking prevalence was demonstrated among nurses who had worked 11 to 15 years (0.9%), and the highest (7.7%) among those who had worked for more than 25 years. Nurses who had worked between 2 and 5 years, comprised 15.4% of all smokers and smoked at a rate of 3.6%. Refer to Figure 2.

Discussion

The overall smoking prevalence among Chinese nurses surveyed during our study was around 3%, which is lower than most other contemporary investigations of this topic, as demonstrated in Table 2. To our knowledge this is one of the lowest rates of nurses' smoking ever published. Even a large literature review conducted by Adriaanse et al (1991) found only one country with a rate comparable to ours (Finland: 3% current smokers and 5% former smokers). As such, this suggests that Chinese nurses smoke at very low rates overall, even when compared internationally. Stratification by age revealed that over one-third of all smokers were aged between 45 and 50 years, a group which also incurred the highest smoking prevalence. A definite trend was observed with respect to smoking and age, with no nurses younger than 25 years who smoked. This result is contrary to a previous study of nurses' smoking habits in New Zealand, where a progressively lower rate was seen among older nurses (Hay, 1998). Why older Chinese nurses would be more inclined to smoke than their younger counterparts is perplexing, although it may relate to stress, addiction or a combination of social factors. It is possible that older Chinese smokers may simply be less inclined to give up their habit. A national smoking survey for example, revealed that the prevalence of regular tobacco use among Chinese women clearly increased with age (Yang et al., 1999), similar to our investigation. There also appears to be very few ex-smokers in China, with just over two percent of respondents in the national survey fulfilling this category (Yang et al., 1999). Furthermore, almost three-quarters of current Chinese smokers had no intention of quitting (Yang et al., 2001). Aside from our results merely reflecting general social trends, there may

also be a demographic or cultural bias against younger nurses or potential student nurses who already smoke. Such phenomenon might prevent a large proportion of female smokers from even entering the nursing profession. Further research will be required to elucidate this hypothesis, however.

When stratified by gender, men comprised the majority of smokers in our study, with roughly half of them being current tobacco users. In the province where our research was conducted, (Hebei), it has traditionally been frowned upon for women to smoke tobacco. This may have resulted in a relatively low smoking prevalence among the nurses surveyed, simply because the majority were female. As most nurses in China are women (Xu et al., 2000), it may therefore be possible to extrapolate our low prevalence rate for female nurses to the wider nursing demographic. If so, this suggests a very encouraging trend. On the other hand however, the smoking rate and frequency among male nurses was less positive, with over half of them being current tobacco users. Although most could be classified as moderate smokers, their average duration of smoking was considerable, with fewer than 8% having smoked less than 20 years. Again, this seems to reflect general community trends in China, where the average number of cigarettes smoked per day is steadily increasing (Mackay, 1997). It is difficult to ascertain exactly why smoking severity is rising, although it may relate to the relative increases in community affluence seen in recent years. On the other hand, it may simply reflect an increasing level of nicotine addiction across the wider social strata.

When compared to population data from the World Health Organization (WHO), the Chinese nurses in our study appear to smoke tobacco at a rate much lower than the community in which they live (3% vs. 29%) (World Health Organization, 2005). This is contrary to previous Japanese research, where nurses smoked at a higher rate than the general population (Ohida et al., 1999). On the other hand, stratifying our data by gender revealed that the prevalence rate among male nurses (52%) was comparable to the current population rate for Chinese males (53%) (World Health Organization, 2005), both of which are still very high. It is interesting to contemplate why smoking rates among the Chinese nurses in our investigation appear to be much lower than the community in which they live. It is possible that nurses understand the negative health implications of smoking more quickly than the general population. For example, in a study of tobacco smoking among the general population conducted by Yang et al (1999), few Chinese smokers recognized that lung cancer and heart disease could be caused by their smoking habit.

As tertiary education and a licensure examination is usually required to become a registered nurse in China (Smith & Tang, 2004), nurses would presumably have a more advanced understanding of biological mechanisms and public health issues, than the community in which they live. This wide disparity in general health knowledge might explain the correspondingly wide disparity in smoking prevalence between the two groups. On the other hand, there may be certain occupational factors which make it difficult for nurses to smoke at work. In the hospitals we studied for example, patients and staff are not permitted to smoke indoors. As Chinese nurses are very busy and the hospitals were multi-

storey, this may mean that nurses simply do not have enough time to go outside and smoke during their rest breaks. Although it was not measured during our investigation, the hospital's no-smoking rule probably ensures that passive exposure to tobacco is also quite low for hospital nurses. This is contrary to community research previously undertaken in China, where it was shown that over half of all Chinese non-smokers were exposed to environmental tobacco smoke for at least 15 minutes per day (Yang et al., 1999).

Whatever the reason for disparities in smoking prevalence rates between nurses and the wider community, China's smoking epidemic is fast becoming a serious public health issue, and an increasing proportion of the population are now smoking tobacco and dying from it (Chen et al., 1997; Lam et al., 1997; Mackay, 1997; Liu et al., 1998; Niu et al., 1998; Yang et al., 1999; World Health Organization, 2005). This in turn, represents an important consideration for contemporary nurses, particularly those involved with public health and community nursing. Being both primary health care providers and health professionals who have regular contact with patients, nurses are in an ideal position to lead the fight against tobacco. Unfortunately, preventing tobacco smoking does not appear to be high on the list of government-supported public health priorities, particularly considering the recent and more alarming dangers of SARS, avian influenza and HIV. Although it is imperative that Chinese nurses help promote anti-smoking campaigns for their patients and themselves, it is difficult to predict how effective any such interventions might be. A previous national survey for example, found that 72% of current smokers had no intention of giving up their habit (Yang et al., 2001). More alarmingly, a survey

conducted by Li et al (1999) showed that Chinese physicians believed tobacco smoking was simply a 'universal phenomena' and that there was little social pressure for people to quit. In the same study, over half of the male physicians were current smokers, and few counseled their patients about smoking. Given that Chinese smokers are now beginning their habit at younger ages (Mackay, 1997), and that Chinese physicians may not be taking an active role in smoking prevention (Li et al., 1999); there would appear to be numerous future challenges for nurses in meeting this rising public health menace.

Despite these potential obstacles, China does have a reasonably impressive history in certain aspects of anti-smoking legislation. In 1983 for example, China was the first country in the world to ban smoking on all domestic air flights. In 1990, the Chinese Association on Smoking and Health was established, and one which has organized annual symposia since that time. World No-Tobacco Day is celebrated annually in China. In 1994, China also succeeded in banning cigarette advertising in both print and electronic media (Mackay, 1997). As such, there is certainly potential to reduce tobacco consumption among both the general public and the nurses who protect them. As mentioned earlier, the vast professional resource of China's one million nurses will need to be mobilized with a focused and sustained anti-smoking campaign. As our study suggests that older nurses and male nurses in this country are the most likely to use tobacco, it appears that young female nurses (who are already setting a good example by not smoking) should be at the forefront of anti smoking campaigns. The traditional cultural values of Chinese women as family caregivers would further strengthen their ability to effect positive change in this regard.

When considering the results of our investigation and how they fit into the big picture of smoking among Chinese nurses, it is worth considering the inherent strengths and weaknesses of the study itself. Firstly, our survey captured a large cross-section of over 500 nurses from two major hospitals in Shijiazhuang city. Secondly, the response rate was very high (roughly 98%), allowing near-complete coverage of this large group. As hospitals employ the majority of contemporary Chinese nurses, we are subsequently confident that our results accurately portray a wider population of nurses; at least within Hebei province, and possibly nationwide. Additional confidence stems from the fact that our smoking prevalence rates by age appear to reflect national smoking trends (Yang et al., 1999).

Nevertheless, China has a very large professional nursing workforce spread out over an equally large geographic area, ensuring that some intrinsic differences must occur. There is also the issue of self-reporting surveys and their inherent limitations. What people report, may differ from what they actually do. Despite this fact, self-reporting surveys are commonly used for evaluating smoking habits, and have previously been employed during large national surveys in China (Yang et al., 1999; Yang et al., 2001). As such, we were confident that a properly conducted and culturally appropriate questionnaire study would help gather reliable and useful information on nurses' smoking habits. Given the solid knowledge base that we have established in the current study, future investigations should now be conducted to help elucidate the national prevalence of tobacco use among Chinese nurses.

Conclusion

Although our study suggests that tobacco smoking is relatively uncommon among Chinese nurses, the rate among male nurses is very high, similar to that of the general population. Among the respondents, the distribution of risk was not uniform, with a high proportion of smokers being concentrated in the older age groups. As such, future preventive measures will need to consider the individual situation of nurses who smoke, particularly those who occupy the older age groups.

References

Adriaanse, H., Van Reek, J., Zandbelt, L. & Evers, G. (1991). Nurses' smoking worldwide. A review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959-1988. *International Journal of Nursing Studies*, 28, 361-375.

Brinkman, G.L. & Coates, E.O. (1963). The effect of bronchitis, smoking and occupation on ventilation. *American Review of Respiratory Diseases*, 87, 684-693.

Chen, Z.M., Xu, Z., Collins, R., Li, W.X. & Peto, R. (1997). Early health effects of the emerging tobacco epidemic in China. *Journal of the American Medical Association*, 278, 1500-1504.

Garfinkel, L. & Stellman, S.D. (1986). Cigarette smoking among physicians, dentists and nurses. *CA Cancer Journal for Clinicians*, 36, 2-8.

Hay, D.R. (1998). Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. *New Zealand Medical Journal*, 111, 102-104.

Heloma, A., Reijula, K., Tikkanen, J. & Nykyri, E. (1998). The attitudes of occupational health personnel to smoking at work. *American Journal of Industrial Medicine*, 34, 73-78.

Hodgetts, G., Broers, T. & Godwin, M. (2004). Smoking behaviour, knowledge and attitudes among Family Medicine physicians and nurses in Bosnia and Herzegovina. *BMC Family Practice*, 5, 12.

Hussain, S.F., Tjeder-Burton, S., Campbell, I.A. & Davies, P.D.O. (1993). Attitudes to smoking and smoking habits among hospital staff. *Thorax*, 48, 174-175.

Lam, T.H., He, Y., Li, L.S., Li, L.S., He, S.F. & Liang, B.Q. (1997). Mortality attributable to cigarette smoking in China. *Journal of the American Medical Association*, 278, 1505-1508.

Li, H.Z., Fish, D. & Zhou, X. (1999). Increase in cigarette smoking and decline of anti-smoking counselling among Chinese physicians: 1987-1996. *Health Promotion International*, 14, 123-131.

Liu, B.Q., Peto, R., Chen, Z.M., Boreham, J., Wu, Y.P., Li, J.Y., Campbell, T.C. & Chen, J.S. (1998). Emerging tobacco hazards in China: 1. Retrospective proportional mortality study of 1 million deaths. *British Medical Journal*, 317, 1411-1422.

Mackay, J. (1997). Beyond the clouds – Tobacco smoking in China. *Journal of the American Medical Association*, 278, 1531-1532.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A. & McElwee, G. (2001). Qualified nurses' smoking prevalence: Their reasons for smoking and desire to quit. *Journal of Advanced Nursing*, 35, 769-775.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A. & McElwee, G. (2003). The role of stress, peer influence and education levels on the smoking behaviour of nurses. *International Journal of Nursing Studies*, 40, 359-366.

Nelson, D.E., Giovino, G.A., Emont, S.L., Brackbill, R., Cameron, L.L., Peddicord, J. & Mowery, P.D. (1994). Trends in cigarette smoking among US physicians and nurses. *Journal of the American Medical Association*, 271, 1273-1275.

Niu, S.R., Yang, G.H., Chen, Z.M., Wang, J.L., Wang, G.H., He, X.Z., Schoepff, H., Boreham, J., Pan, H.C. & Peto, R. (1998). Emerging tobacco hazards in China: 2. Early mortality results from a prospective study. *British Medical Journal,* 317, 1423-1424.

Ohida, T., Osaki, Y., Kobayashi, Y., Sekiyama, M. & Minowa, M. (1999). Smoking prevalence of female nurses in the national hospitals of Japan. *Tobacco Control*, 8, 192-195.

Rowe, K. & Macleod Clark, J. (2000a). Why nurses smoke: A review of the literature. *International Journal of Nursing Studies*, 37, 173-181.

Rowe, K. & Macleod Clark, J. (2000b). The incidence of smoking amongst nurses: A review of the literature. *Journal of Advanced Nursing*, 31, 1046-1053.

Smith, D.R. & Tang, S. (2004). Nursing in China: Historical development, current issues and future challenges. *Journal of Oita Nursing and Health Sciences*, 5, 16-20.

Torres Lana, A., Cabrera de León, A., Marco Garcia, M.T. & Aguirre Jaime, A. (2005). Smoking and sickness absence among public health workers. *Public Health*, 119, 144-149.

Willaing, I., Jørgensen, T. & Iversen, L. (2003). How does individual smoking behaviour among hospital staff influence their knowledge of the health consequences of smoking? *Scandinavian Journal of Public Health*, 31, 149-155.

World Health Organization. http://www.who.int/tobacco (accessed April 2005)

Yang, G., Fan, L., Tan, J., Qi, G., Zhang, Y., Samet, J.M., Taylor, C.E., Becker, K. & Xu, J. (1999). Smoking in China: Findings of the 1996 National Prevalence Survey. *Journal of the American Medical Association*, 282, 1247-1253.

Yang, G., Ma, J., Chen, A., Zhang, Y., Samet, J.M., Taylor, C.E. & Becker, K. (2001). Smoking cessation in China: Findings from the 1996 National Prevalence Survey. *Tobacco Control*, 10, 170-174.

Xu, Y., Xu, Z. & Zhang, J. (2000). The nursing education system in the People's Republic of China: Evolution, structure and reform. *International Nursing Review*, 47, 207-217.

Zanetti, F., Gambi, A., Bergamaschi, A., Gentilini, F., De Luca, G., Monti, C. & Stampi, S. (1998). Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health*, 112, 57-62.

Table 1 Smoking Prevalence, Frequency and Duration among Chinese Nurses

	%	(95% CI) [a]		%	(95% CI) [a]
All Nurses			**Smoking Rate**		
Never Smoked	97.2	(95.7 – 98.5)	<5 per Day	15.4	(4.3 – 42.2)
Current Smoker	2.6	(1.5 – 4.3)	5-15 per Day	61.5	(35.5 – 82.3)
Previous Smoker	0.2	(0.03 – 1.1)	>15 per Day	23.1	(8.2 – 50.3)
Males Only			**Smoking Duration**		
Never Smoked	43.5	(29.2 – 67.0)	<20 Years	7.7	(1.4 – 33.3)
Current Smoker	52.2	(33.0 – 70.8)	20-30 years	69.2	(42.4 – 87.3)
Previous Smoker	4.3	(1.0 – 21.0)	>30 Years	23.1	(8.2 – 50.3)
Median Values			**Brinkman Index** [b]		
Smoking Rate	11.0 Smokes / Day		Light Smoker	15.4	(4.3 – 43.2)
Smoking Duration	25.0 Years Smoking		Moderate Smoker	69.2	(42.3 – 87.3)
Quit Smoking	10.0 Years Ago		Heavy Smoker	15.4	(4.3 – 43.2)

[a] Computed 95% Confidence Intervals for prevalence rates,

[b] Adapted from Brinkman & Coates (1963)

Figure 1 Smoking Prevalence among Chinese Nurses by Age Range

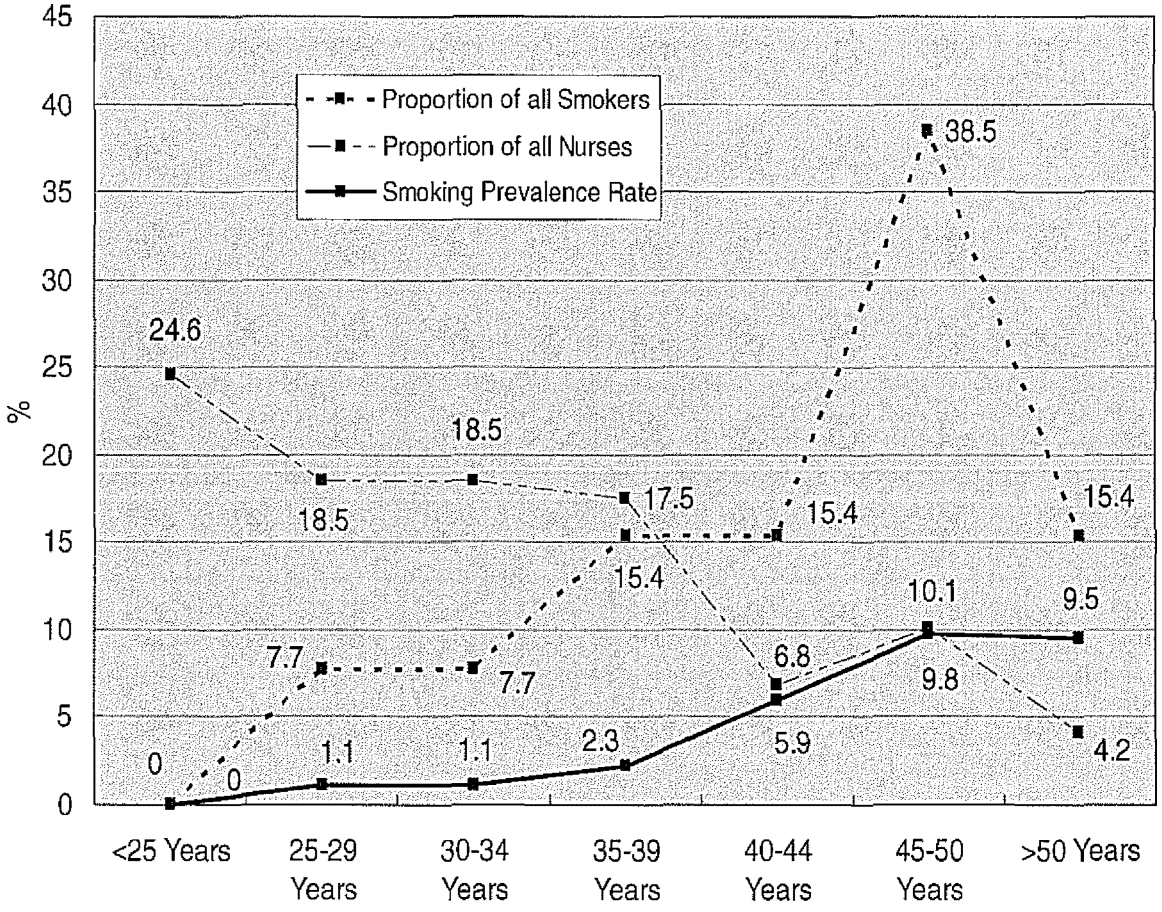

Figure 2 Smoking Prevalence among Chinese Nurses by Career Length

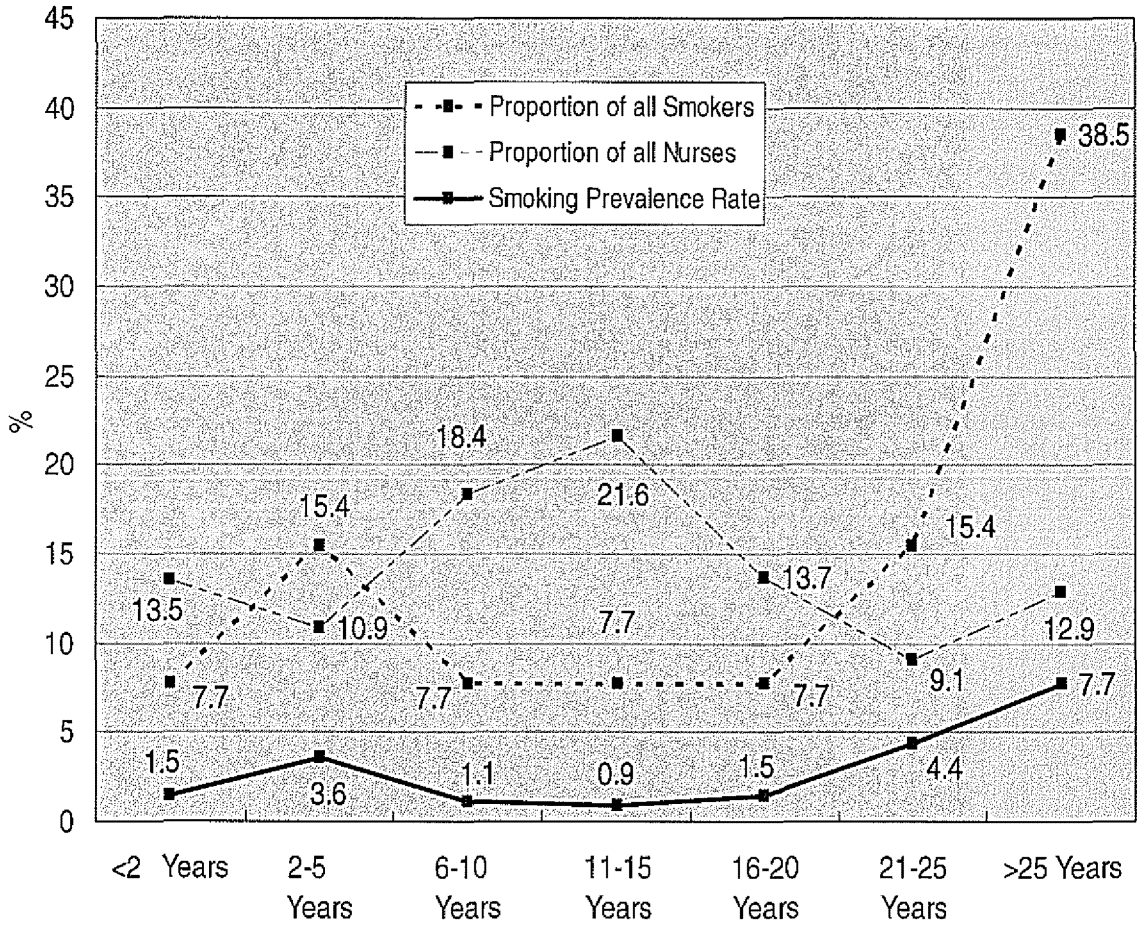

Table 2 International Comparison of Nurses' Smoking Prevalence

Country	Rate [a]	Subjects	Location	Author	Year
Spain	53%	1623	Health System	Torres Lana et al	2005
Balkans	51%	273	Medical Clinics	Hodgetts et al	2004
Italy	41%	2453	Hospital Study	Zanetti et al	1998
Denmark	28%	445	Hospital Study	Willaing et al	2003
Ireland	26%	1074	National Survey	McKenna et al	2003
Britain	20%	1069	Hospital Study	Hussain et al	1993
Japan	19%	2207	National Survey	Ohida et al	1999
United States	18%	901	National Survey	Nelson et al	1994
New Zealand	18%	30 507	Census Data	Hay	1998
Finland	15%	727	National Survey	Heloma et al	1998
China	3%	509	Hospital Study	Smith et al	2005 [b]

[a] Prevalence rates rounded to the nearest whole number,

[b] The current study

Part 4

Tobacco Smoking among Medical Students

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Tobacco Smoking Habits among Chinese Medical Students and their Need for Health Promotion Initiatives

ABSTRACT

This study comprised a questionnaire survey of tobacco smoking habits among 224 medical students in Shijiazhuang City, China (response rate: 92.4%). There were slightly more males than females (53.1% vs. 46.9%) and their average age was 22.3 years. The overall prevalence of smoking was 6.3% (95%CI 3.7 – 10.4), with a further 1.9% being ex-smokers (95%CI 1.0 – 4.9). There were no female smokers when stratified by gender, although the prevalence among male students was 13.4% (95%CI 8.0 – 21.6). Of those who smoked, the median number was 3.0 cigarettes per day, for a period of 2.5 years. Of the 1.9% of students who were ex-smokers, the median time passed since quitting was 7.0 years. The majority of smokers (61.5%) smoked 3 to 5 cigarettes per day, with the most common duration (53.8%) being 3 to 4 years. Smoking rates varied significantly by age (P for Trend = 0.0001), with students younger than 22 years having the lowest prevalence (6.1%). Over half of all smokers (53.9%) were aged between 22 and 23 years. Overall, this study suggests that health promotion interventions are now required among Chinese medical students. As 6% to 13% of them appear to be smokers, their demographic may be a perfect starting point for any such initiatives.

Introduction

Although the community smoking rate within most industrialized countries is undergoing a continuous decline, in developing regions it is actually increasing by around 3% per year (1,2). China represents one such area where tobacco use has boomed, largely due to an increasingly affluent society and aggressive marketing by tobacco companies. It is now the world's largest consumer of tobacco and tobacco-related products, with over 300 million regular smokers (3). The community smoking rate has risen to alarming levels, with around two-thirds of adult males being current smokers (4). China's smoking epidemic is also worsening, with more people taking up the habit at younger ages and consuming greater quantities of cigarettes per day (5). Tobacco has now become a major cause of death in this country, with lung cancer rates increasing at approximately 5% per year (1) and about half of China's 300 million smokers predicted to die from tobacco-related diseases in future (6).

Health promotion will be a key factor in combating this epidemic. As the next generation of Chinese physicians and the medical students who follow them will be at the forefront of any such initiatives, it is imperative that they become role models for appropriate health behavior. Despite this fact, tobacco smoking has not been well-studied among Chinese medical students, particularly those in rural areas. Although the World Health Organization currently lists the smoking prevalence among medical doctors at around 61% for males and 12% for females (4), it is unclear whether medical students smoke at similar levels. As successful health promotion initiatives should be specifically targeted to meet the personal, social and cultural needs of the target group; accurate information

on their demographic is essential. The objective of our study therefore, was to investigate the epidemiology of tobacco smoking among medical students in Shijiazhuang City, Hebei Province. Results may then be generalized to the wider population of medical students throughout Mainland China.

Methods

Ethical approval was obtained from appropriate ethics committees and the study was undertaken in accordance with ethical protocols relevant to Mainland China. Data was gathered by means of a self-reporting questionnaire adapted from other investigations (7-16). The English version was translated by a panel of bilingual medical professionals, before being back-translated and checked against the original. It consisted of a simple tick-box format, with questions focusing on current and previous tobacco smoking, number of cigarettes smoked per day and total duration of smoking, as well as basic demographic items such as age, sex and gender. Questionnaires were distributed to a convenience sample of medical students in Shijiazhuang City (approximately 280 km south-west of Beijing) during lecture periods, and collected at the end of each session. There were no penalties or rewards for participation, and informed consent was implied if questionnaires were completed and returned. Due to the high initial response rate, a reminder was not required. Data was entered into a spreadsheet program and analyzed by statistical software. Basic statistics were calculated, with smoking prevalence rates evaluated by gender and stratified by age. Differences in age-related smoking rates (P for Trend) were established using the chi square test. Computed 95% Confidence Intervals (95%CI) were also established for smoking prevalence rates. Figures

for smoking duration and severity were calculated as percentages of all students who answered those particular questions.

Results

We received 207 completed questionnaires from a total group of 224 medical students, yielding a high response rate of 92.4%. There were slightly more males than females (53.1% vs. 46.9%) and their average age was 22.3 years. The overall prevalence of smoking was 6.3% (95%CI 3.7 – 10.4), with a further 1.9% being ex-smokers (95%CI 1.0 – 4.9). There were no female smokers when stratified by gender, although the prevalence among male students was 13.4% (95%CI 8.0 – 21.6). Of those who smoked, the median number was 3.0 cigarettes per day, for a period of 2.5 years. Of the 1.9% of students who were ex-smokers, the median time passed since quitting was 7.0 years. The majority of smokers (61.5%) smoked 3 to 5 cigarettes per day, with the most common duration (53.8%) being 3 to 4 years. Smoking rates varied significantly by age (P for Trend = 0.0001), with students younger than 22 years having the lowest prevalence (6.1%). Although they only accounted for 5.4% of the entire group by number, the highest smoking prevalence was seen among students aged 24 to 26 years (36.4%). Over half of all smokers (53.9%) were aged between 22 and 23 years.

Discussion

The overall smoking prevalence among male medical students was around 13%, which is higher than other investigations conducted in Australia (7) and Egypt (8), where between 2% and 3% of male medical students smoked. On the other

hand, their smoking rate was lower than previous studies conducted in a variety of countries such as Holland (9), Kenya (8), Colombia (10), Turkey (11), Albania (12), Japan (13), Tuscany (14) and Russia (7); where the prevalence among males ranged from 19% to 48%, and 16% to 25% among females. When compared to population data from the World Health Organization (WHO) (4), it appears that Chinese medical students smoke tobacco (13% in men, 0% in women and 6% overall) at a much lower rate than the community in which they live (67% in men, 4% in women and 36% overall).

It is interesting to contemplate why smoking rates among medical students differ from the surrounding community. When considering physicians who have already graduated, previous research suggests that their comparatively low smoking rates may be attributed to some key factors. Doctors probably understand the 'medical' message more quickly, there may be an intrinsic conflict between being a health care provider and undertaking unhealthy behaviors, and finally; because smoking usually gains a negative image in the medical profession long before it does so in the wider community (17). As such, the rate of smoking among physicians in a particular country seems to reflect the maturity of its smoking epidemic, with a 'mature' epidemic occurring when the rate among physicians falls below that of the community (17). Nonetheless, it is possible that Chinese physicians and medical students may not see themselves as role models for healthy behavior. A previous study by Ohida et al (18) suggested this might already occur among their Japanese counterparts, and may help explain the relatively high smoking rates currently seen among Japanese physicians. If so, health promotion activities for Asian medical

professionals will need to consider the social and cultural aspects of cognitive dissonance in this region.

When stratified by gender, we found that there were no female smokers at all, which is similar to other Asian investigations conducted among medical graduates in Malaysia (15) and Hong Kong (16). This finding may suggest a cultural or societal reluctance to smoke among Asian females. Tobacco smoking may be viewed by Chinese people as being an inappropriate behavior for women, although this cultural phenomenon seems to vary by geographical location. Either way, with such a low smoking rate, female physicians and their undergraduate counterparts would seem to be ideally placed to lead anti-smoking health promotion initiatives within the Asia-pacific region. As females continue to bear the burden of childrearing responsibilities within many Asian societies, they may also incur an additional reluctance to smoke for the sake of their children and / or unborn babies. Again, this represents an important cultural factor which should be exploited to help meet China's current smoking epidemic. Aside from advertising health promotion initiatives in Chinese language, it may also be useful to utilize specific Chinese characters and Confucian ideals which resonate strongly with Asian women.

Age represents another consideration when planning health promotion interventions for Chinese medical students. In the current study, we found that older students had the highest smoking prevalence when stratified by age. This is similar to some previous research conducted among physicians in the Netherlands (9), where higher smoking rates were seen in the older age groups.

Dekker et al (9) suggested that it may be due to a 'generational effect' as the social climate of a country changes with respect to tobacco. Such a hypothesis may also be appropriate in China, although further research will needed to establish this fact. The median number of cigarettes smoked per day during our study was 3, which is much lower than the Chinese national average (10 for women and 15 for men) (5), and certainly very encouraging in its own right. This finding is however, contrary to a previous study of Dutch physicians and medical students, where students smoked the highest number of cigarettes per week (9). Why our medical students consume relatively few cigarettes per day is difficult to understand, although it suggests that health promotion interventions to help them quit may be successful, as the possibility of severe, physical addiction is probably not very high.

Conclusion

Overall, this study suggests that health promotion interventions are now required among Chinese medical students. China's smoking epidemic is fast becoming a serious public health concern, which in turn, represents an important consideration for the medical profession, particularly the next generation of doctors who must lead the way in tobacco-cessation activities and other forms of anti-smoking health promotion. The fact that some medical students continue to use tobacco, suggests that high smoking rates can probably be expected in the next generation of young Chinese. A key facet in controlling this issue must come from the Chinese medical association and the central government, who should now be lobbied to introduce a focused and sustained anti-smoking campaign among young people. As 6% to 13% of

Chinese medical students appear to be smokers, their demographic may be a perfect starting point for any such health promotion initiatives.

References

1) Chelala C. Tobacco corporations step up invasion of developing countries. *The Lancet* 1998; (351): 889.

2) Boutayeb A, Boutayeb S. The burden of non communicable diseases in developing countries. *International Journal for Equity in Health* 2005; (4): 2.

3) Yang G, Fan L, Tan J, et al. Smoking in China: Findings of the 1996 National Prevalence Survey. *Journal of the American Medical Association* 1999; (282): 1247-53.

4) World Health Organization. http://www.who.int (accessed May 2005)

5) Mackay J. Beyond the clouds – Tobacco smoking in China. *Journal of the American Medical Association* 1997; (278): 1531-2.

6) Lam TH, He Y, Li LS, et al. Mortality attributable to cigarette smoking in China. *Journal of the American Medical Association* 1997; (278): 1505-8.

7) Tessier JF, Fréour P, Nejjari C, Belougne D, Crofton JW. Smoking behaviour and attitudes towards smoking of medical students in Australia, Japan, USA, Russia, and Estonia. *Tobacco Control* 1993; (2): 24-9.

8) Tessier JF, Fréour PP, Nejjari C, Belougne D, Crofton JW. Smoking behaviour and attitudes of medical students towards smoking and anti-smoking campaigns: A survey in 10 African and Middle Eastern countries. *Tobacco Control* 1992; (1): 95-101.

9) Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. *Social Science and Medicine* 1993; (36): 817-22.

10) Rosselli D, Rey O, Calderon C, Rodriguez MN. Smoking in Colombian medical schools: The hidden curriculum. *Preventive Medicine* 2001; (33): 170-4.

11) Kocabas A, Burgut R, Bozdemir N, et al. Smoking patterns at different medical schools in Turkey. *Tobacco Control* 1994; (3): 228-35.

12) Vakeflliu Y, Argjiri D, Peposhi I, Agron S, Melani AS. Tobacco smoking habits, beliefs, and attitudes among medical students in Tirana, Albania. *Preventive Medicine* 2002; (34): 370-3.

13) Kawane H. Smoking among Japanese physicians. *Journal of the American Medical Association* 2001; (286): 917.

14) Melani AS, Verponziani W, Boccoli E, et al. Tobacco smoking habits, attitudes and beliefs among nurse and medical students in Tuscany. *European Journal of Epidemiology* 2000; (16): 607-11.

15) Yaacob I, Abdullah ZA. Smoking habits and attitudes among doctors in a Malaysian hospital. *Southeast Asian Journal of Tropical Medicine and Public Health* 1993; (24): 28-31.

16) Cheng KK, Lam TH. Smoking among young doctors in Hong Kong: A message to medical educators. *Medical Education* 1990; (24): 158-63.

17) Davis RM. When doctors smoke. *Tobacco Control* 1993; (2): 187-8.

18) Ohida T, Sakurai H, Mochizuki Y, et al. Smoking prevalence and attitudes toward smoking among Japanese physicians. *Journal of the American Medical Association* 2001; (285): 2643-8.

Table 1 Tobacco Smoking Habits among Chinese Medical Students

	%	(95% CI) [a]		n	(%) [b]
All Students			**Smoking Rate**		
Never Smoked	91.8	(87.2 – 94.8)	1 – 2 per Day	2	(15.4)
Current Smoker	6.3	(3.7 – 10.4)	3 – 5 per Day	8	(61.5)
Previous Smoker	1.9	(1.0 – 4.9)	>5 per Day	3	(23.1)
Males Only			**Smoking Duration**		
Never Smoked	82.5	(73.7 – 88.8)	1 – 2 Years	4	(30.8)
Current Smoker	13.4	(8.0 – 21.6)	3 – 4 Years	7	(53.8)
Previous Smoker	4.1	(1.6 – 10.1)	>4 Years	2	(15.4)
All Smokers	**Median**		**Smoking by Age [e]**		
Smoking Rate [c]	3.0 Smokes per Day		20 – 21 Years	2	(6.1)
Smoking Duration [c]	2.5 Years Smoking		22 – 23 Years	7	(4.4)
Quit Smoking [d]	7.0 Years Ago		24 – 26 Years	4	(36.4)

[a] Computed 95% Confidence Intervals for prevalence rates, [b] Percentages calculated as a proportion of students who answered each question, [c] Current smokers, [d] Ex-smokers, [e] Statistically-significant differences in smoking prevalence by age range evaluated using the chi-square test (P for Trend = 0.0001)

Part 5

Tobacco Smoking among Nursing Students

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Tobacco Smoking Habits among a Complete Cross-Section of Australian Nursing Students

ABSTRACT

Aim: To undertake a complete cross-sectional survey of tobacco smoking habits among students at an Australian nursing school, for what appears to be the first time. *Methods:* An anonymous self-reporting questionnaire survey was used to gather data. *Results:* Data from 270 individuals was analysed, giving a final response rate of 84.6%. Among all students, the overall smoking rate was 15.9%, with 14.6% of males and 16.2% of females being current smokers. The prevalence of smoking varied by year of study in the nursing course, ranging from 13.0% to 23.1%. As a group, nursing students consumed an average of 11.5 cigarettes per day, they began smoking at 20.8 years of age, with an average smoking duration of 7.2 years. Students who had previously worked as a nurse were twice as likely to be current smokers, regardless of age or year of study in the nursing course. Nursing students over 40 years of age and those in the third year of study were over three times as likely to be ex-smokers. *Conclusions:* Overall, this study suggests that while tobacco smoking remains fairly common among Australian nursing students, its prevalence and distribution varies according to the individual demographics of the group under study. Given these issues, further research which helps ascertain exactly why student nurses continue to smoke is clearly needed from both a local and international perspective.

Introduction

Nurses represent the largest professional group in health care, and the high rate of smoking among them has long been a cause of concern (Adriaanse et al., 1991). The implications of unsuitable health behaviours are particularly important because nurses are visible public role models and smokers will invariably consult them for anti-smoking advice (Charlton et al., 1997). Furthermore, nurses are well-placed to advise and educate patients about the dangers of tobacco use (Clark et al., 2004). As many of their personal smoking-related behaviours and attitudes are developed during nurse training, nursing students also play a major role in smoking prevention within the community (Baron-Epel et al., 2004). This has significant implications for future practice, as research suggests that a nursing student's intended preventive behaviour after graduation is probably influenced by their own smoking habits. In one Danish study for example, nursing students who smoked were less likely to give anti-smoking advice to patients (Sejr & Osler, 2002). Clearly therefore, any successful tobacco-control activities within the nursing profession will need to begin prior to graduation from the nursing school environment. As such, it is important that public health policy makers understand the smoking habits and demographic of nursing students within their sphere of operations. For these reasons, tobacco usage surveys among nursing students have become an increasingly popular research topic in the nursing profession during recent years (Smith, 2006).

Despite this fact, tobacco smoking research is comparatively rare among Australian nursing students. The first such study appears to have been

published in 1980 (Neil et al., 1980), as a survey of smoking patterns and attitudes among students of nursing and teaching. In 1994 another publication described an investigation of smoking habits among nursing and education students (Adams et al., 1994), although their methodology utilized a convenience sample and only included participants from the third year. Nagle and colleagues (Nagle et al., 1999) recruited a large group of Australian hospital nurses, of which 7.3% were nurse educators or students, although the smoking rates and habits of the latter group were not clearly defined. In 2004, Clark and colleagues published the results of their investigation conducted among second and third year nursing students (Clark et al., 2004). In a 2005 journal paper, McCann and colleagues (McCann et al., 2005) also looked at Australian nursing students' attitudes towards smoking health promotion, although again, their methodology relied on a convenience sample and only included participants in the second and third years of study. As such, it appears that no study of tobacco smoking has ever been conducted among a complete cross-section of Australian nursing students. Given these limitations in the current knowledge base, we considered it necessary to undertake a complete cross-sectional survey of tobacco smoking habits among students at an Australian nursing school, for what appears to be the first time.

Methods

This study targeted all undergraduate nursing students enrolled at a large university in tropical northern Australia during 2004. The Australian nursing degree currently takes three years of full-time university study, following which time a successful graduate may apply for registration with a relevant nursing

board in their state of residence and thereby become a registered nurse (Smith, 2003). As such, there were three separate grades of nursing student enrolled at our university (representing the first, second and third years of study in the course), with a total enrolment of 319 individuals. Ethical approval was obtained from a university human ethics committee prior to commencement of the study. Our anonymous questionnaire was distributed and collected by a researcher who was not affiliated with the nursing school. All students were invited to participate in the current investigation. Questionnaires were distributed and collected at the end of a pre-arranged lecture period, following a short introduction by the nursing lecturer and one of the authors. There were no penalties or rewards for participation, and students were assured that participation was completely voluntary. Informed consent was thereby implied if students completed and returned their anonymous questionnaires.

Our questionnaire was based on previous tobacco smoking studies conducted among nursing students in Australia (Adams et al., 1994; Clark et al., 2004; McCann et al., 2005; Nagle et al., 1999; Neil et al., 1980) and elsewhere (Ahmadi et al., 2004; Baron-Epel et al., 2004; Blakey & Seaton, 1992; Boccoli et al., 1996; Carmichael & Cockcroft, 1990; Charlton et al., 1997; Krommydas et al., 2004; Najem et al., 1995; Ohida et al., 2001a; Ohida et al., 2001b; Sekijima et al., 2005; Suzuki et al., 2005; West & Hargreaves, 1995). The first section focused on demographic items such as age, gender, year of study at university and whether they had previously worked as a nurse prior to entering the course. This particular question was deemed to be very important because nursing education has only shifted to the Australian university system since the mid

1980s (Smith, 2003). As such, many Australian nurses who were trained under the previous hospital-based system are now entering universities to upgrade their qualifications. We anticipated that out student demographic would include some older students of this nature, as well as other middle-aged people who had recently entered university looking for a career change. Aside from demographic items, our survey also contained numerous questions on smoking habit, including current smoking status, prior history of smoking, number of cigarettes smoked per day, total years of smoking (for current smokers), total years since quitting (for ex-smokers), as well as the age at which they first began smoking. In Australia, a current smoker is defined as an individual who smokes tobacco products daily, weekly or less often than weekly. An ex-smoker is a person who has smoked at least 100 cigarettes or the equivalent tobacco in their lifetime, but does not smoke at all now. A never smoking person is an individual who does not smoke now and has smoked fewer than 100 cigarettes or the equivalent tobacco in their lifetime (Australian Institute of Health and Welfare, 2002).

Data were anonymously coded and entered into a spreadsheet program, with the results analysed as a group and also stratified by year of study within the nursing course. Basic statistics were calculated, including smoking prevalence rates by gender and year of study. Differences in students' demographic items and tobacco smoking prevalence rates by year of study were investigated using the chi square test (P for Trend). Differences in tobacco smoking rates by gender were also determined using the chi square test. Statistically-significant differences in daily tobacco consumption rates by gender and year of study

were evaluated using One Way Analysis of Variance (ANOVA). A Brinkman Index of smoking severity (adapted from Brinkman & Coates, 1963) was calculated for all current smokers. ANOVA was also used to investigate differences between heavy smokers and light smokers on the Brinkman Index, with regard to age. To allow for clear visualisation of the main results a combination of tables and figures were used when displaying the data (Altman & Bland, 1996).

Statistical correlations between smoking status and demographic items were evaluated in a combined model using logistic regression, with smoking status (smoker or ex-smoker) being used as the dependent variable and demographic items used as the independent variables. Statistical correlations between smoking severity on the Brinkman Index, age of smoking initiation and demographic items were evaluated in a combined model using logistic regression. In this calculation, a Brinkman rating of moderate or heavy was used as the dependent variable and demographic items were used as the independent variables. A similar regression model was also run to investigate the age of smoking initiation versus demographic items. For this latter calculation, the median age at which the nursing student first began smoking (18 years) was used as the dependent variable, as the data for this variable was skewed about the mean. Results for all logistic regression analyses were expressed as adjusted Odds Ratios (OR) with 95% Confidence Intervals (95%CI) and Probability (P) values. P values below 0.05 were considered statistically significant throughout. In these calculations, the odds ratio assumes the null hypothesis (where there is no increased likelihood of an event

occurring) and thus, the referent group has an odds ratio of 1.0 (Bland & Altman, 2000). All regression analyses used the logical reference variable for each item (for example: being female or not, previous experience as a nurse or not), except for the year of study where the first year (i.e. Year 1) was used as the reference variable when compared to the second and third years.

Results

From a total group of 319 students, 274 questionnaires were returned. Four were excluded due to incomplete answers, allowing data from a final group of 270 individuals to be analysed (thereby giving a final response rate of 84.6%). The average age of students varied, ranging from 23.7 years in the first year of study to 28.8 years in the third year of study. There were no statistically-significant differences in the students' overall age when compared by gender. A large proportion were female (ranging from 80.9% to 90.2%), with over half the third year students (54.9%) having previously worked as a nurse. The average age of students who had previously worked as a nurse (29.1 years) was significantly higher than those who had not (23.2 years) (P = 0.0001). Among all nursing students in this study, the overall smoking rate was 15.9%, with 14.6% of males and 16.2% of females reporting themselves to be current tobacco smokers. The prevalence of current smoking varied significantly by year of study (P for Trend = 0.0277), ranging from 13.0% to 23.1% in the first and second years, respectively. The prevalence of previous smoking also varied significantly by year of study (P for Trend = 0.0252), ranging from 72.1% to 79.2%. Refer to Table 1. Current smoking prevalence did not vary significantly between the genders in each year of study. Refer to Figure 1. Among current

smokers, the average number of cigarettes smoked per day was not significantly different between males (13.8 cigarettes) and females (11.0 cigarettes). Refer to Figure 2.

As a group, the nursing students in this study who smoked consumed an average of 11.5 cigarettes per day, they began smoking at 20.8 years of age, with an average smoking duration of 7.2 years. There were no statistically-significant differences by gender with regard to the average duration of smoking. Nevertheless, almost half the students (42.0%) were smoking over 10 cigarettes per day, while their smoking duration was fairly evenly divided between 1-2 years, 3-5 years and >5 years. When classified according to the Brinkman Index of smoking severity (Brinkman & Coates, 1963), the majority (80.0%) were light smokers. Refer to Table 2. Although a slightly increasing trend in the average number of cigarettes smoked per day was observed between the three years of study at university, these differences were not statistically significant. Refer to Figure 3. When age was stratified into four distinct categories (<20 years, 20-30 years, 31-40 years and >40 years), an increasing, but not statistically-significant, prevalence of current smokers was observed. The prevalence of former smokers did however, vary by a statistically-significant amount (P for Trend = 0.0001). Refer to Figure 4. Nursing students who were classified on the Brinkman Index as being either moderate or heavy smokers were significantly older (41.7 years) than those classified as light smokers (24.7 years) (P = 0.0001). Refer to Figure 5.

Not all of the previously mentioned statistical associations remained during analysis in combined logistic regression models. Nevertheless, nursing students who had previously worked as a nurse were twice as likely to be current smokers when compared to their student colleagues who had not worked before (OR: 2.43, 95%CI: 1.18 – 5.02, P = 0.0161), regardless of age or year of study in the nursing course. Nursing students over 40 years of age and those in the third year of study were over three times as likely to be ex-smokers, when compared to their colleagues (OR: 3.60, 95%CI: 1.01 – 11.62, P = 0.0360 and OR: 3.33, 95%CI: 1.12 – 10.09, P = 0.0303, respectively). Nursing students who were classified as either 'Moderate' or 'Heavy' smokers on the Brinkman Index were 13.60 times more likely to be aged over 40 years, when compared to 'Light' smokers (OR: 13.60, 95%CI: 1.37 – 199.76, P = 0.0329). Nursing students who had previously worked as a nurse were six times more likely to have begun smoking before they were 18 years of age (OR: 6.62, 95%CI: 1.20 – 55.34, P = 0.0446).

Discussion

Our study represents one of the first investigations of tobacco smoking ever conducted among a complete cross-section of Australian nursing students. While there is little cross-sectional data of this nature from Australia, similar studies have been conducted among nursing students in other countries (Ahmadi et al., 2004; Baron-Epel et al., 2004; Blakey & Seaton, 1992; Boccoli et al., 1996; Carmichael & Cockcroft, 1990; Charlton et al., 1997; Krommydas et al., 2004; Najem et al., 1995; Sekijima et al., 2005; Suzuki et al., 2005; West & Hargreaves, 1995). Examination of previous research conducted among

student nurses suggests a number of important issues with regard to smoking prevalence. Firstly, the overall prevalence of smoking shows considerable variation between countries. Around 16% of the nurses in our study were current smokers, a rate which is much higher than that documented in Iran (Ahmadi et al., 2004) where only 3% of nursing students smoked. A similar low smoking rate (6%) was also reported in Japan by Sekijima and colleagues (Sekijima et al., 2005). In Israel (Baron-Epel et al., 2004) and Greece (Krommydas et al., 2004) on the other hand, the prevalence of smoking among nursing students was shown to be 22% and 36%, respectively. Another Japanese study also documented a high smoking rate during their research (24%) (Suzuki et al., 2005). The highest smoking rates of all appear to have been documented some years ago in Italy (Boccoli et al., 1996) and Great Britain (Carmichael & Cockroft, 1990), where roughly half the nursing students surveyed at the time were current users of tobacco (51% and 43%, respectively).

Although they were not strictly cross-sectional in nature, comparison with previous Australian investigations is still worthwhile. The earliest survey of smoking among Australian nursing students appears to have been published in 1980 (Neil et al., 1980). It was conducted among students of nursing and teaching, among whom, 39% and 16% were regular smokers, respectively. In 1994 Adams and colleagues (Adams et al., 1994) described the smoking habits of third year nursing students, among whom 45% of university-based and 65% of hospital-based nursing students identified themselves as being either 'past' or 'present' smokers. While these smoking rates are clearly higher than our

current study, the term 'past or present' smoker is rather ambiguous, making comparisons difficult. Furthermore, as their research methodology utilized a convenience sample, it is difficult to ascertain exactly how representative of Australian nursing students their data actually was. Later in the 1990s, Nagle and colleagues (Nagle et al., 1999) recruited a large group of Australian hospital nurses for a smoking study, among whom 7.3% were reported to be either nurse educators or nursing students. Despite this fact, the smoking rates and habits of their nursing students as a distinct subgroup were not clearly stated. In 2004 Clark and colleagues published the results of their tobacco smoking research conducted among second and third year nursing students, reporting that 24% of the group were current smokers (Clark et al., 2004). Aside from our present study, the most recent Australian research was published by McCann and colleagues (McCann et al., 2005) who appear to have used the same sample as Clark and colleagues (Clark et al., 2004). Either way, from the results of previous Australian studies it can be seen that our nursing students are probably smoking at a fairly low rate when compared nationally and internationally. It is possible that at least some of the differences in smoking prevalence rates may reflect the different demographics from which their samples were sourced, as well as the changing nature of community smoking patterns over time.

Somewhat to our surprise, we did not find a linear increase in smoking prevalence by year of study in the nursing course. Although second year students were more likely to smoke than first year students, the smoking rate decreased again by the third year among males, females and the entire group.

While their smoking prevalence rates by year were certainly different at a statistically-significant level, this was not strictly due to an overall linear increase. As such, our current result was contrary to some previous research from other countries. In Japan for example two separate studies found that smoking prevalence increased by year of study, with senior students smoking at higher rates than their junior colleagues (Sekijima et al., 2005; Suzuki et al., 2005). In the United States, Najem et al. (1995) also revealed that postgraduate nursing students smoked at higher rates when compared to undergraduate nursing students at the same university. These results are not definitive however, with Charlton and colleagues (Charlton et al., 1997) demonstrating that smoking was actually more common among their first year nursing students, when compared to students in the other grades. Similarly, West and Hargreaves (1995) also found that although smoking beliefs did not change during nurse training, nurses more advanced in their training were less likely to be smokers.

Unlike some other international studies, we did not find any statistically-significant differences in tobacco smoking prevalence rates by gender. This is contrary to previous research where nursing students' smoking habits were shown to be associated with gender (Baron-Epel et al., 2004; Ahmadi et al., 2004) and other demographic items (Baron-Epel et al., 2004). A previous Australian study also found that while 24% of the entire group reported themselves to be current smokers, the smoking rate among females (25%) was higher than that of males (19%) (Clark et al., 2004). Similar to smoking prevalence rates, our current study did not find any statistically-significant relationships between smoking intensity and gender. While the average number

of cigarettes smoked per day was higher among males when compared to females, it was probably the male's wider range of values that led to this result. Based on the findings of cross-sectional studies such as ours therefore, it is difficult to conclude to what extent demographic variables affect smoking. Whether smoking always increases or decreases as nursing students progress through their university course is also uncertain. Indeed, in our current study, it is possible that the changing nursing demographic from year to year may be more of a confounding factor than the course itself. Even so, the data obtained from complete cross-sectional studies with high response rates is always useful, and tends to suggest that tobacco use remains an important issue among nursing students around the world.

Given these discrepancies, it is important to consider how the current student demographic within Australian nursing schools differs from their international counterparts, particularly those from Asian countries such as Japan. Firstly, in Australia, the university nursing course currently lasts for three years following the completion of 12 years schooling (Smith, 2003). Nevertheless this does not mean that Australian nursing students or nurses themselves are generally younger than their international counterparts. Indeed, as we have shown, quite the opposite may be true. As previously mentioned in the methods section, this situation probably occurs because many older Australian nurses who were trained under the former hospital-based system are now entering universities to upgrade their qualifications.

The students in our current study therefore comprised a fairly wide age range, from young high school graduates to middle-aged persons. With the increasing modern demand for better-qualified hospital staff, a proportion of these nurses have now chosen to complete a university course in nursing. This demographic shift also has implications for smoking status, with the relatively older age group probably being responsible for the long average duration of smoking we observed. Furthermore, the long smoking history and early age of smoking onset we documented, suggests that a reasonable proportion of Australian nursing students probably begin smoking before they enter nursing school. Whether their smoking prevalence increases as students progress through the nursing school is uncertain, however. Another important demographic issue worth noting when compared to countries such as Japan, was that around ten to twenty percent of the nursing students in our study were male. This suggests that the Caucasian nursing student demographic is somewhat different to that of their Asian counterparts, where the majority of students are still female.

As with any research project, our current study incurred certain limitations which are worth considering. Firstly there is the issue of a cross-sectional study design and the fact that this type of research can only provide a snapshot of the situation among the sampled group. Correlations between smoking status and demographic items therefore, are only valid for the group in which they were identified and for the time period during which the study was conducted. Longitudinal research on the other hand, is much more useful for determining trends over time, particularly with regard to dynamic social factors such as smoking. Even so, quality longitudinal research is very difficult to conduct

among nursing students, simply due to the fact that students become increasingly difficult to follow up as they undertake clinical placements during senior years. This may be at least one reason why the majority of studies to which we compared our current data to were not longitudinal in design.

Despite these limitations, our current study has many strengths and a great deal of confidence can still be inferred from the data. Firstly, a relatively large sample size was recruited, from which a high response rate was obtained. Secondly, we were able to capture an entire cross-section of students within the nursing school, something which appears to have never been done before in Australia. Thirdly, as our institute comprises one of the only universities in the tropical north east region of Australia, it benefits from a wide catchment area. As such, our data would have been highly representative of the nursing student population in this area. Exactly how representative our data was of the entire Australian nursing students demographic, however, is unknown. Further research will need to be conducted to ascertain this fact.

Conclusion

Overall, this study suggests that while tobacco smoking remains fairly common among Australian nursing students, its prevalence and distribution is not stable, and appears to vary according to the individual demographics of the group under study. As our students comprised a group with a wide range of ages and experiences, smoking rates and habits among them were far from uniform. Although there was some evidence to suggest that smoking rates might increase by year of study in the nursing course, again, our results were not

linear in this regard. Given these issues, further research which helps ascertain exactly why student nurses continue to smoke is clearly needed from both a local and international perspective. Future researchers will also need to consider the changing demographic base from which the new generation of nursing students are being drawn.

Whatever the reasons for smoking among students within our current study, it is clear that the promotion of tobacco control activities remains an important goal in nursing, and one that should begin in the university environment. Furthermore, despite the realisation that many nursing students continue to smoke, very few researchers have undertaken intervention studies among this demographic. To our knowledge, only a few such studies appear to have been published in English over the past few years, while the overall benefits of tobacco smoking interventions appear to be limited. In Denmark for example, Sejr & Osler (2002) administered lectures on the health consequences of smoking to a group of students over a period of time. While the authors used a carefully controlled study design, by the follow-up period no change in smoking rates had been observed. Another study was conducted in Northern Ireland which consisted of individualized counselling for each nursing student (Rowe & Clark, 1999). Although one-quarter of smokers had apparently quit by the follow-up period, the relative value of this intervention should be treated with caution, as participants were required to have 'expressed a desire to give up smoking' and were assigned to the intervention program or control group 'based on their preferences' (p. 303). Although these results may be a little disappointing, the value of antismoking interventions should not be

underestimated, as preventing nursing students from starting to smoke as well as helping those who already smoke to quit represents a critical issue in the future of nursing education. At least one researcher (Hope et al., 1998) has suggested that specific health promotion skills should be integrated into nurse education. Despite the absence of a clearly effective intervention for smoking within this demographic, tobacco intervention strategies will no doubt be useful in helping to reduce the unacceptable rate of smoking among student nurses around the world (Smith, 2006).

References

Adams, A., Bell, P.F. & Pelletier, S.D. (1994). Nurses and smoking: A comparative study of students of nursing and teaching. *Australian Health Review*, 17, 84-101.

Adriaanse, H., Van Reek, J., Zandbelt, L. & Evers, G. (1991). Nurses' smoking worldwide. A review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959-1988. *International Journal of Nursing Studies*, 28, 361-375.

Ahmadi, J., Maharlooy, N. & Alishahi, M. (2004). Substance abuse: Prevalence in a sample of nursing students. *Journal of Clinical Nursing*, 13, 60-64.

Altman, D.G. & Bland, J.M. (1996). Presentation of numerical data. *British Medical Journal*, 312, 572.

Australian Institute of Health and Welfare (AIHW) (2002), *2001 National Drug Strategy Household Survey: Detailed findings*, Drug Statistics Series No.11, AIHW, Canberra.

Bland, J.M. & Altman, D.G. (2000). The odds ratio. *British Medical Journal*, 320, 1468.

Bobo, J.K. & Husten, C. (2000). Sociocultural influences on smoking and drinking. *Alcohol Research and Health*, 24, 225-232.

Baron-Epel, O., Josephsohn, K. & Ehrenfeld, M. (2004). Nursing students' perceptions of smoking prevention. *Nurse Education Today*, 24, 145-151.

Blakey, R. & Seaton, A. (1992). Smoking attitudes amongst nursing tutors and their students. *Health Bulletin (Edinburgh)*, 50, 417-421.

Boccoli, E., Federici, A., Melani, A.S. & De Paola, E. (1996). Results of a questionnaire about nurse students' smoking habits and knowledges in an Italian teaching school of nursing. *European Journal of Epidemiology*, 12, 1-3.

Brinkman, G.L. & Coates, E.O. Jr. (1963). The effect of bronchitis, smoking, and occupation on ventilation. *American Review of Respiratory Disease*, 87, 684-693.

Carmichael, A. & Cockcroft, A. (1990). Survey of student nurses' smoking habits in a London teaching hospital. *Respiratory Medicine*, 84, 277-282.

Charlton, A., While, D. & Mochizuki, Y. (1997). A survey into the smoking habits of nursing students. *Nursing Times*, 93, 58-60.

Clark, E., McCann, T.V., Rowe, K. & Lazenbatt, A. (2004). Cognitive dissonance and undergraduate nursing students' knowledge of, and attitudes about, smoking. *Journal of Advanced Nursing*, 46, 586-594.

Hope, A., Kelleher, C.C. & O'Connor, M. (1998). Lifestyle practices and the health promoting environment of hospital nurses. *Journal of Advanced Nursing*, 28, 438-447.

Krommydas, G., Kotrotsiou, E., Raftopoulos, V., Paralikas, T., Gourgoulianis, K.I. & Molyvdas, P.A. (2004). Smoking in health science students with asthma. *Canadian Respiratory Journal*, 11, 476.

McCann, T.V., Clark, E. & Rowe, K. (2005) Undergraduate nursing students' attitudes towards smoking health promotion. *Nursing and Health Sciences*, 7, 164-174.

Melby, C.S. (2005). Examining the future of professional journals. *Nursing and Health Sciences*, 7, 219-220.

Nagle, A., Schofield, M., Redman, S. (1999) Australian nurses' smoking behaviour, knowledge and attitude towards providing smoking cessation care to their patients. *Health Promotion International* 14:2, 133-144.

Najem, G.R., Passannante, M.R. & Foster, J.D. (1995). Health risk factors and health promoting behavior of medical, dental and nursing students. *Journal of Clinical Epidemiology*, 48, 841-849.

Neil, J.V., Clark, D. & Muller, M. (1980). The smoking patterns and attitudes of student nurses and student teachers. *Australian Nurses Journal*, 9, 47-48.

Ohida, T., Sakurai, A., Kamal, A., Sone, T., Takemura, S. & Fukushima, T. (2001a). Smoking among Japanese nursing students: A nationwide survey. *Tobacco Control*, 10, 397.

Ohida, T., Kamal, A.A., Takemura, S., Sone, T., Minowa, M. & Nozaki, S. (2001b). Smoking behavior and related factors among Japanese nursing students: A cohort study. *Preventive Medicine*, 32, 341-347.

Rowe, K. & Clark, J.M. (1999). Evaluating the effectiveness of a smoking cessation intervention designed for nurses. *International Journal of Nursing Studies*, 36, 301-311.

Sejr, H.S. & Osler, M. (2002). Do smoking and health education influence student nurses' knowledge, attitudes, and professional behavior? *Preventive Medicine*, 34, 260-265.

Sekijima, K., Seki, N. & Suzuki, H. (2005). Smoking prevalence and attitudes toward tobacco among student and staff nurses in Niigata, Japan. *Tohoku Journal of Experimental Medicine*, 206, 187-194.

Smith, D.R. (2003). A brief overview of nursing in Australia: Historical development, current situation and future issues for the new millennium. *Journal of the Japan Academy of Nursing Sciences*, 23, 40-45.

Smith, D.R. (2006). A systematic review of tobacco smoking among nursing students. *Nurse Education in Practice* (article in press)

Suzuki, K., Ohida, T., Yokoyama, E., Kaneita, Y. & Takemura, S. (2005). Smoking among Japanese nursing students: Nationwide survey. *Journal of Advanced Nursing*, 49, 268-275.

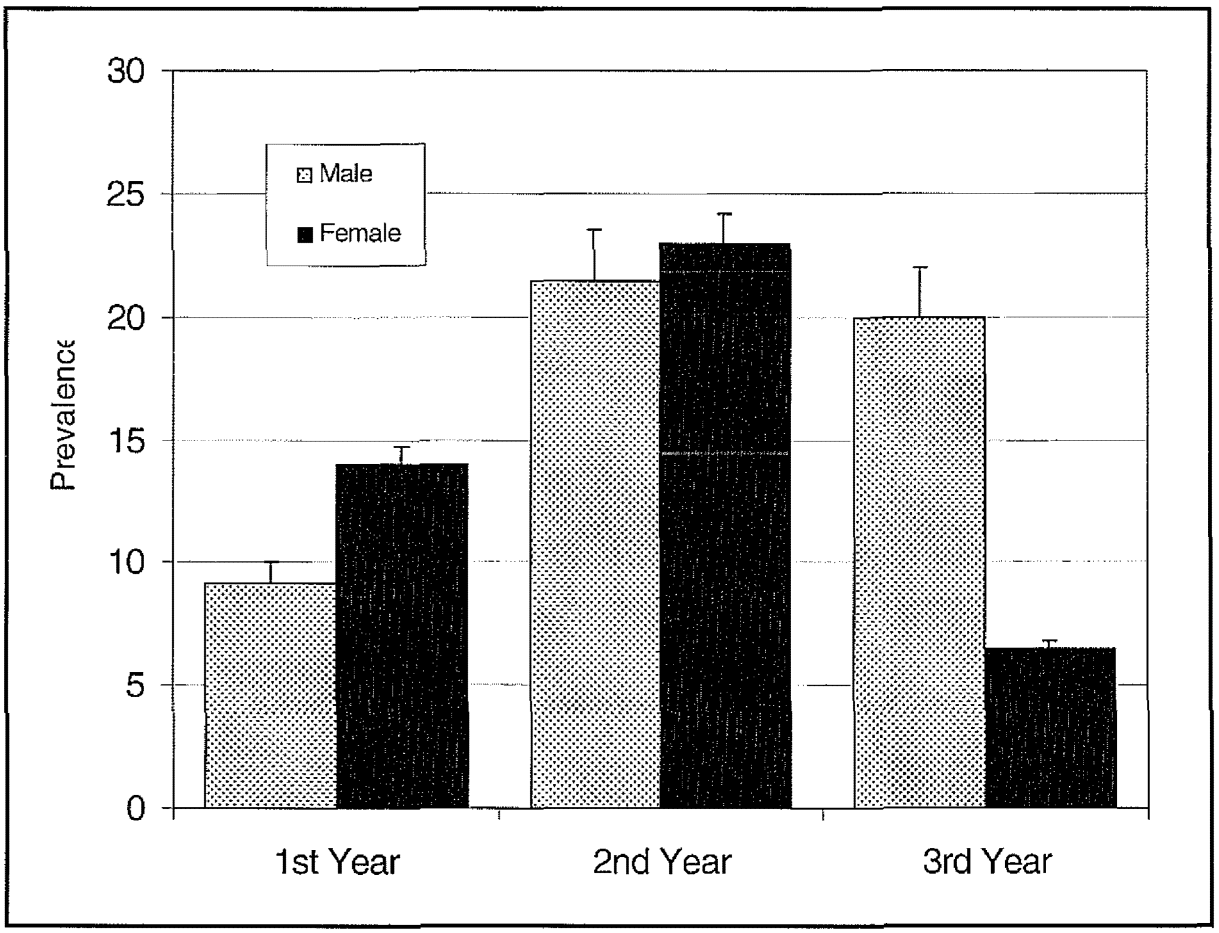
West, R. & Hargreaves, M. (1995). Factors associated with smoking in student nurses. *Psychology and Health*, 10, 195-204.

Table 1 Demographic Items and Tobacco Smoking by Year of Study

	1st Year [a]	**2nd Year** [a]	**3rd Year** [a]
Demographics			
Age (years) [b]	23.7±8.4	25.1±8.9	28.8±9.5
Female	80.9%	86.5%	90.2%
Nurse before [c]	18.3%	40.4%	54.9%
Smoking [d]			
Never Smoked	79.2%	72.1%	74.5%
Current Smoker	13.0%	23.1%	7.8%
Previous Smoker	7.8%	4.8%	17.7%

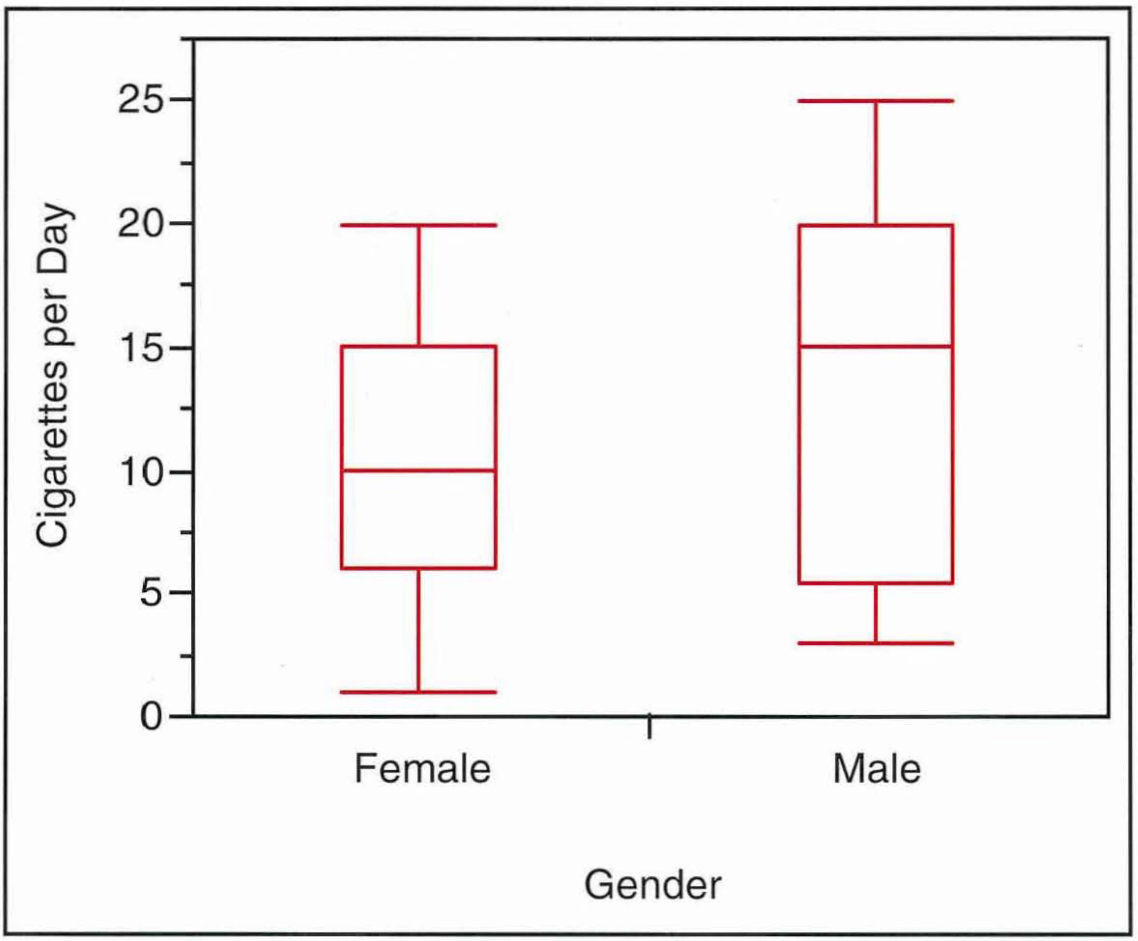
[a] Percentage among each group by year of study, [b] Mean ± Standard Deviation, [c] Previous paid employment as a nurse, [d] Statistically-significant differences in smoking prevalence by year of study evaluated using the chi-square test (Never smoked: P for Trend = 0.4742, Current smoker: P for Trend = 0.0277 and Previous smoker: P for Trend = 0.0252)

Figure 1 Prevalence of Current Tobacco Smoking by Gender and Year of Study



Statistically-significant differences in tobacco smoking rates by gender and year of study evaluated using the chi-square test (1st Year: P = 0.5404, 2nd Year: P = 0.8750, 3rd Year: P = 0.2870)

Figure 2 Average Daily Cigarette Consumption by Gender



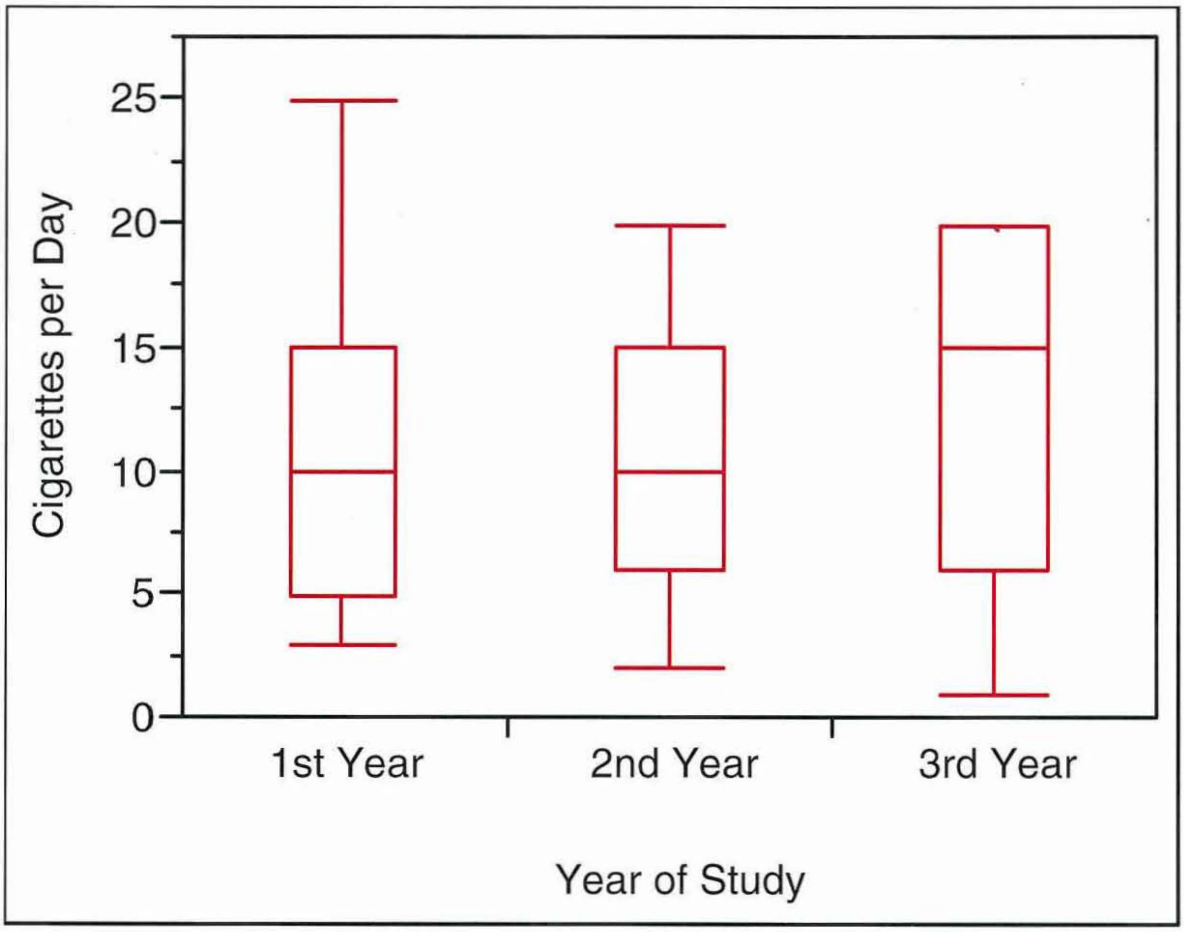
Statistically-significant differences in daily tobacco consumption by gender evaluated using One Way Analysis of Variance (P = 0.2286)

Table 2 Tobacco Smoking Rate, Duration and Mean Values

	Proportion [a]		**Proportion** [a]
Smoking Rate		**Brinkman Index** [b]	
1-5 per Day	22.0%	Light Smoker	80.0%
6-10 per Day	36.0%	Medium Smoker	14.3%
>10 per Day	42.0%	Heavy Smoker	5.7%
Smoking Duration		**Mean Values** [c]	
1-2 Years	32.4%	Smokes per Day	11.5±6.3
3-5 years	35.2%	Initiation Age d	20.8±7.4
>5 Years	32.4%	Years of Smoking	7.2±8.4

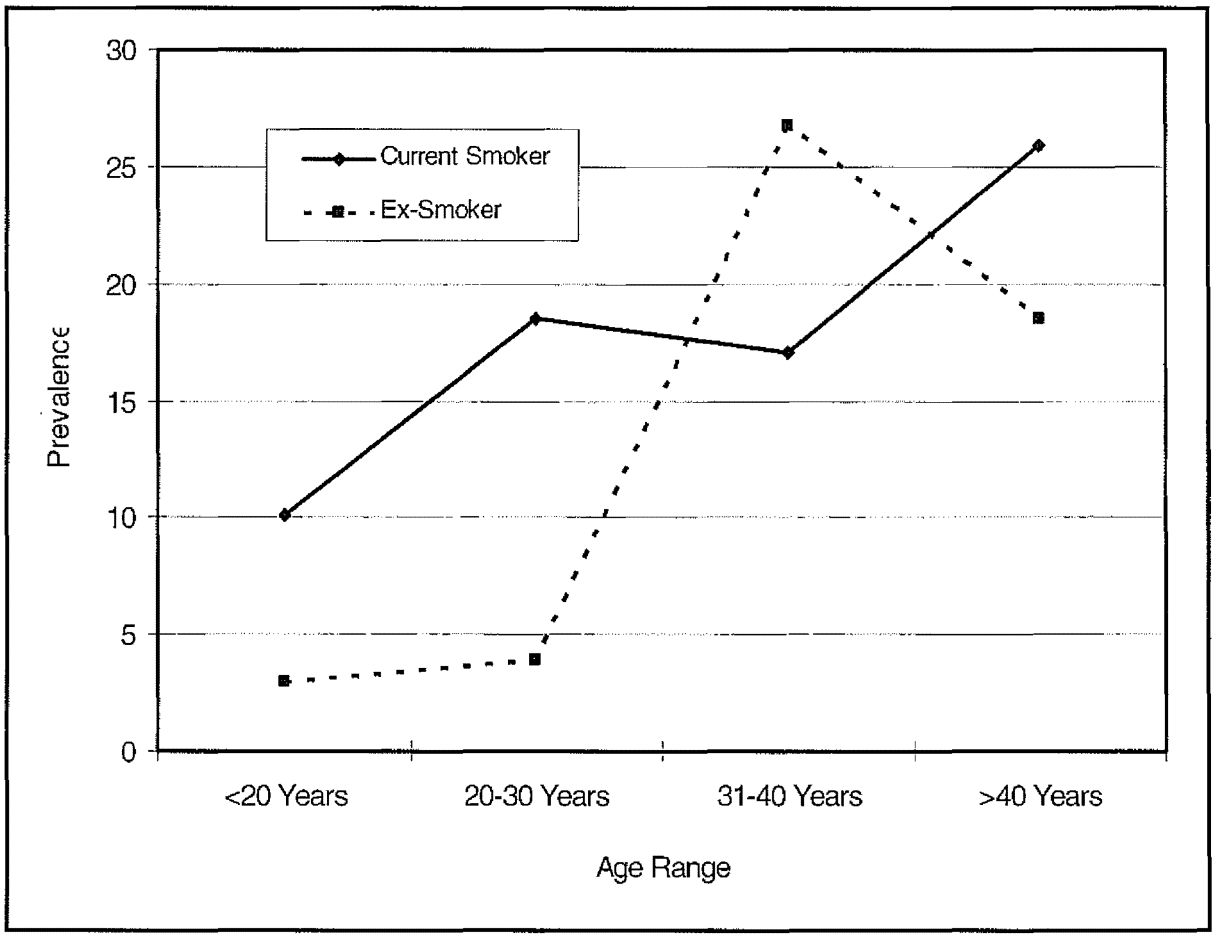
[a] Proportion of smokers in each subgroup, [b] Brinkman Index of smoking severity (Brinkman & Coates, 1963), [c] Mean ± Standard Deviation, [d] Age at which the nursing student first began smoking

Figure 3 Average Daily Cigarette Consumption by Year of Study



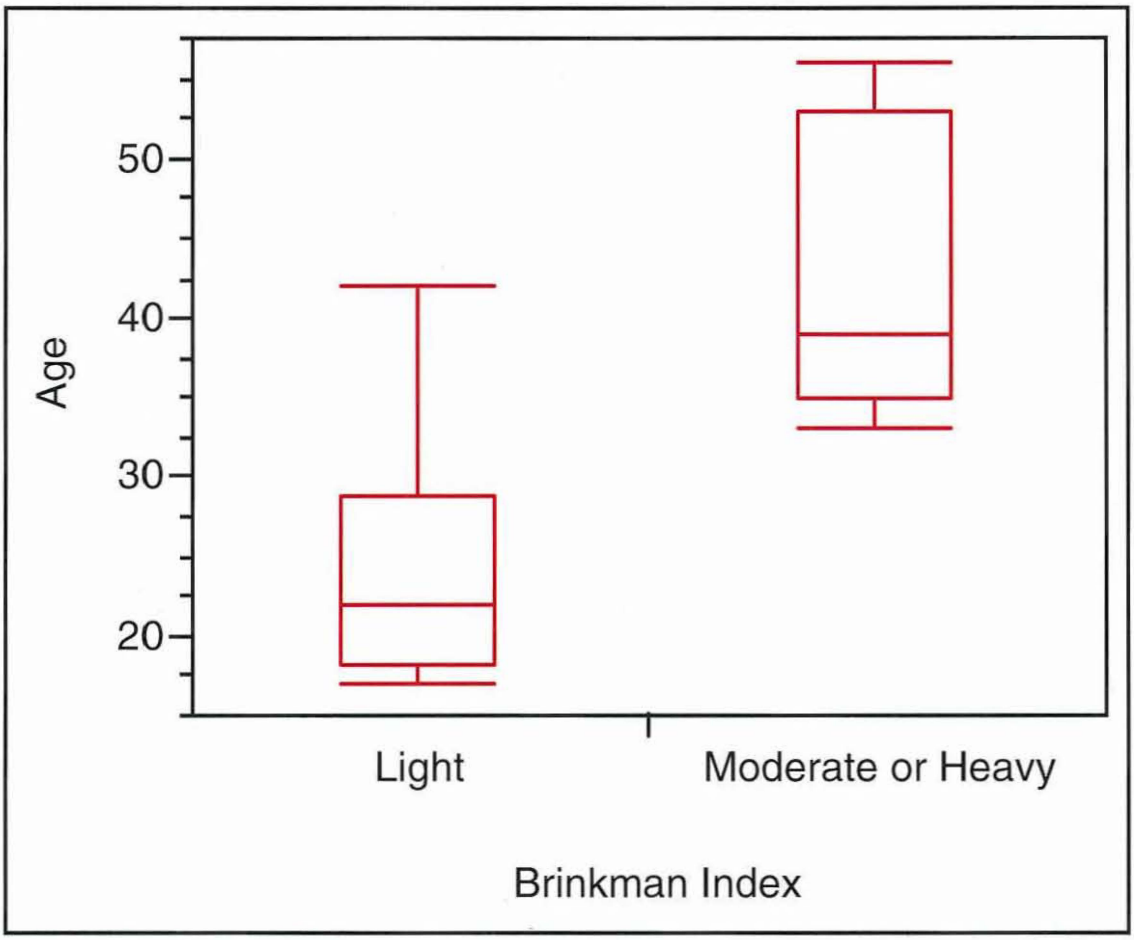
Statistically-significant differences in daily tobacco consumption by year of study evaluated using One Way Analysis of Variance (P = 0.7389)

Figure 4 Current Smoking and Previous Smoking Prevalence by Age Range



Statistically-significant differences in current smoking and previous smoking prevalence rates by age range evaluated using the chi-square test (Current smoking: P for Trend = 0.1679, Previous smoking: P for Trend = 0.0001)

Figure 5 Brinkman Index of Smoking Severity by Age



Statistically-significant differences in Brinkman Index of smoking severity (Brinkman & Coates, 1963) by age evaluated using One Way Analysis of Variance (P = 0.0001)

Table 3 Statistical Correlations with Tobacco Smoking Status

Correlates [a]	**OR**	**(95%CI)**	**P Value**
Current Smoker			
Female Gender	0.97	(0.34 - 2.40)	0.9466
Age >40 Years	1.61	(0.55 - 4.25)	0.3566
Prior Nursing [b]	2.43	(1.18 - 5.02)	0.0161
1st Year of Study [c]	1.00	-	-
2nd Year of Study	1.60	(0.77 - 3.40)	0.2139
3rd Year of Study	0.37	(0.10 - 1.16)	0.1115
Ex-Smoker			
Female Gender	1.90	(0.57 - 5.45)	0.2561
Age >40 Years	3.60	(1.01 - 11.62)	0.0360
Prior Nursing b	0.40	(0.12 - 1.15)	0.1080
1st Year of Study [c]	1.00	-	-
2nd Year of Study	0.72	(0.21 - 2.23)	0.5755
3rd Year of Study	3.33	(1.12 - 10.09)	0.0303

[a] Statistical correlations with smoking status evaluated using multiple logistic regression and expressed as adjusted Odds Ratios (OR) with 95% Confidence Intervals (95%CI) and Probability (P) values, [b] Previous paid employment as a nurse, [c] First year students were used as the referent group

Table 4 Statistical Correlations with Smoking Intensity and History

Correlates [a]	**OR**	**(95%CI)**	**P Value**
Brinkman Index [b]			
Female Gender	2.84	(0.26 - 30.26)	0.3653
Age >40 Years	13.60	(1.37 - 199.76)	0.0329
Prior Nursing [c]	1.40	(0.13 - 14.52)	0.7724
1st Year of Study [d]	1.00	-	-
2nd Year of Study	1.10	(0.06 - 17.83)	0.9449
3rd Year of Study	1.74	(0.13 - 23.24)	0.6647
Initiation Age [e]			
Female Gender	1.97	(0.28 - 18.30)	0.5102
Age >40 Years	2.42	(0.24 - 56.00)	0.4873
Prior Nursing [c]	6.62	(1.20 - 55.34)	0.0446
1st Year of Study [d]	1.00	-	-
2nd Year of Study	2.60	(0.28 - 31.28)	0.4053
3rd Year of Study	6.13	(0.50 - 132.26)	0.1856

[a] Statistical correlations evaluated using multiple logistic regression and expressed as adjusted Odds Ratios (OR) with 95% Confidence Intervals (95%CI) and Probability (P) values, [b] Having a Brinkman Index of 'Moderate' or 'Heavy' (Brinkman & Coates, 1963), [c] Previous paid employment as a nurse, [d] First year students were used as the referent group, [e] Age at which the nursing student first began smoking (the median age of smoking initiation was 18 years)

Chapter 3

Summary and Recommendations

Summary

OVERVIEW

This thesis comprises five literature reviews and five research projects on the topic of tobacco smoking among health care workers. Research was conducted on groups of dentists, doctors, nurses, medical students and nursing students in Australia and China between 2004 and 2006. The review component targeted all published literature on the topic, from which a total of 289 English language manuscripts were examined. From an international perspective the prevalence of smoking among almost all health care workers appears to be declining in recent years, although in certain regions of Europe and Asia their smoking rate remains unacceptably high. Low rates of smoking among dentists and doctors were demonstrated in the United States, Australia and the United Kingdom.

REVIEW ARTICLES

The review of smoking among dentists located a total of 35 English-language studies published in the past 25 years which met the inclusion criteria. Results suggest that the prevalence of smoking is quite low among dentists worldwide, and that it is also declining in most countries during recent years. The lowest rates were documented in the United States (US), Thailand, Finland, Australia and Canada. When multiple studies were examined over time, it appears that dentists in Australia and the US consistently report the lowest prevalence. Overall, the review suggested that dentists have one of the lowest smoking rates among all health professionals

The review of smoking among physicians located a total of 80 English-language studies published in the past 30 years that met the inclusion criteria. Two distinct trends were evident. Firstly, most developed countries have shown a steady decline in physicians' smoking rates during recent years. On the other hand, physicians in some developed countries and many newly-developing regions appear to be smoking at high rates. The lowest overall smoking rates were consistently documented in the United States, Australia and the United Kingdom. Comparison with other health professionals suggests that physicians often smoke at a lower rate than nurses, and sometimes less than dentists.

The review of smoking habits among nurses located a total of 73 English-language studies which met the inclusion criteria. The review suggested that while tobacco smoking among nurses appears to be decreasing in many countries during recent years, the international trend is far from uniform, and some developed nations still report high smoking rates among their nursing staff. From a methodological perspective, the relative epidemiological quality of smoking research has also fluctuated over time, making it difficult to compare the results of one study to the next.

The review of smoking among medical students located a total of 66 manuscripts which met the inclusion criteria. The most common countries previously studied included India, the United States, Australia, Japan, Pakistan, Turkey and the United Kingdom. Overall, the review suggested that the prevalence of smoking among medical students varies widely between different countries, and also between male and female students within the same areas.

Consistently low smoking rates were found in Australia and the United States, while

The review of smoking among nursing students located a total of 35 articles which met the inclusion criteria. Results suggest that although smoking appears to be fairly common among nursing students, its prevalence and distribution varies widely depending on the country of study and time period during which the research was undertaken. There is some evidence to suggest that smoking rates increase by year of study in the nursing course, but not all research has shown a clear association in this regard. The value of anti-smoking interventions for nursing students appears to be limited, based on currently available information.

RESEARCH ARTICLES

The research on dentist's smoking habits utilized an anonymous, self-reporting questionnaire, which was posted to 400 dentists in Queensland (response rate: 72.1%). The prevalence of current smoking was estimated to be 3.9%, with a further 11.0% being ex-smokers. Smoking rates varied by age, with 6.1% of dentists aged younger than 30 years who were smokers. The lowest smoking prevalence was seen among dentists aged between 30 and 40 years (1.4%), and the highest among those aged over 60 years (7.1%). Overall, the study suggested that the prevalence of smoking is rather low among Queensland dentists

The research on physician's smoking habits targeted a complete cross-section of 361 physicians working in all hospital departments at a teaching hospital in Hebei Province, China. The overall response rate was 79.2%, among whom 15.7% were current smokers and 1.0% ex-smokers. There were no female smokers when stratified by sex, although the prevalence rate among male physicians was 31.9%. The prevalence of smoking varied widely by hospital department, ranging from zero in the obstetrics and gynaecology department, to 32.6% in the surgical unit. Smoking rates also varied by age, with physicians younger than 25 years having the lowest prevalence (6.3%)

The study of smoking among nurses captured a large cross-section of contemporary Chinese nurses were surveyed, with a total of 509 replies obtained from 520 nurses (response rate: 97.9%). Their overall prevalence of smoking was 2.6%. When stratified by gender, the prevalence rate among male nurses was 52.2%. Of those who smoked, the median number was 11 smokes per day for a period of 25.0 years. When categorized by severity, 15.4% were light smokers, 69.2% moderate smokers and 15.4% heavy smokers. When stratified by age there were no smokers under 25 years, with the prevalence between 25 and 34 years similarly low, at 1.1%. The highest smoking rate was among nurses aged 45 to 50 years (10.1%), even though they only comprised 9.8% of the total workforce.

The study of smoking among medical students involved 207 questionnaires received from a total group of 224 medical students (response rate: 92.4%). The overall prevalence of smoking was 6.3%, with a further 1.9% being ex-

smokers. There were no female smokers when stratified by gender, although the prevalence among male students was 13.4%. Of those who smoked, the median number was 3.0 cigarettes per day, for a period of 2.5 years. The majority of smokers (61.5%) smoked 3-5 cigarettes per day, with the most common duration (53.8%) being 3-4 years. Smoking rates varied significantly by age (p for trend = 0.0001), with students younger than 22 years having the lowest prevalence (6.1%).

The study of smoking among nursing students involved an anonymous self-reporting questionnaire survey that was distributed to 270 students (response rate: 84.6%). Their overall smoking rate was 15.9%, with 14.6% of males and 16.2% of females being current smokers. Their prevalence of smoking varied by year of study in the nursing course, ranging from 13.0% to 23.1%. As a group, nursing students consumed an average of 11.5 cigarettes per day, they began smoking at 20.8 years of age, with an average smoking duration of 7.2 years. Students who had previously worked as a nurse were twice as likely to be current smokers, regardless of age or year of study in the nursing course.

Recommendations

In this study, the prevalence, distribution, tobacco smoking habits and correlates for smoking were ascertained among various groups of health care workers in Australia and China. By profession, dentists were shown to have uniformly low smoking rates in the current study, while nurses by contrast had relatively high rates. In the research component, almost one-third of male Chinese doctors and one-half of male Chinese nurses were smokers. Only 6% of Chinese medical students and 4% of Queensland dentists smoked. Sixteen percent of Australian nursing students were smoking tobacco however, a habit which was correlated with age and year of study in the nursing course.

Overall, the research described within this thesis suggests that while tobacco smoking is probably declining among health care workers in recent years, the trend has not been uniform across these professions, nor has it occurred equally from country to country. Nurses and nursing students in particular, remain a subpopulation where tobacco smoking is fairly common. Due to the current inequity, there are a few recommendations which may be considered based on the results of this research, as outlined below:

- The development of an internationally standardized questionnaire for examining smoking rates among health care workers needs to be developed
- An general agreement on what comprises a "smoking health care worker" needs to be reached so that international research can be more directly comparable

- A greater focus needs to be placed on educating health care students on the dangers of tobacco use, both now and in the future
- Health care students need to be more aggressively targeted in anti-smoking campaigns, both from a community health and university management perspective
- Health care students and health care professionals need to be made more away of their health advocacy role and the damage it may do to quit smoking programs if they themselves are seen to be smoking in public
- The unequal rates of smoking in developed and underdeveloped countries suggests that a greater international commitment to tobacco control programs needs to be made by various international bodies
- Local medical, dental and nursing associations need to become more aggressive in their targeting of anti-smoking campaigns *for their members*
- Overall, it can be suggested that a greater commitment of public health efforts and tobacco control activities will need to target these groups in future

Adoption of the abovementioned recommendations will go a long way in helping to make the health care profession an entirely smoke-free workforce.

Appendix

Part 1

Ethics Approval Forms

Ethical Approval

This appendix contains copies of JCU ethical approval documents H1696 and H1733. All three articles from the Chinese component (Chapter 2, Parts 2, 3 and 4) related to previously published work and comprised an application for 'Credit for Advanced Standing'. As such, copies of ethical approval notices from Chinese institutes are not required to be attached to this thesis

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Part 2

Evidence of Published Articles

Attached Manuscripts

The following manuscripts from this thesis which have already been published are attached. Only the first pages of articles are included in order to save space.

REVIEW ARTICLES

- Smith DR, Leggat PA. An international review of tobacco smoking in the medical profession: 1974-2004. *BMC Public Health* 2007 E-Pub June 20; 7 (1): 115.
- Smith DR, Leggat PA. A comparison of tobacco smoking among dentists in 15 countries. *International Dental Journal* 2006; 56 (5): 283-288.
- Smith DR, Leggat PA. An international review of tobacco smoking research in the nursing profession, 1976-2006. *Journal of Research in Nursing* 2007; 12 (2): 165-181.
- Smith DR, Leggat PA. An international review of tobacco smoking among medical students. *Journal of Postgraduate Medicine* 2007; 53 (1): 55-62.
- Smith DR. A systematic review of tobacco smoking among nursing students. *Nurse Education in Practice* 2007; 7: 293-302.

- Smith DR, Wei N, Zhang YJ, Wang RS. Tobacco smoking habits among a cross-section of rural physicians in China. *Australian Journal of Rural Health* 2006; 14 (2): 66-71.
- Smith DR, Leggat PA. Tobacco smoking prevalence among a cross-section of dentists in Queensland, Australia. *Kurume Medical Journal* 2005; 52 (4): 147-151.
- Smith DR, Wei N, Wang RS. Contemporary smoking habits among nurses in Mainland China. *Contemporary Nurse* 2005; 20 (2): 258-266.
- Smith DR, Wei N, Wang RS. Tobacco smoking habits among Chinese medical students and their need for health promotion initiatives. *Health Promotion Journal of Australia* 2005; 16 (3): 233-235.
- Smith DR, Leggat PA. Tobacco smoking habits among a complete cross-section of Australian nursing students. *Nursing and Health Sciences* 2007; 9 (2): 82-89.

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Review

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An international review of tobacco smoking in the medical profession: 1974–2004

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Abstract

Background: Tobacco smoking by physicians represents a contentious issue in public health, and regardless of what country it originates from, the need for accurate, historical data is paramount. As such, this article provides an international comparison of all modern literature describing the tobacco smoking habits of contemporary physicians.

Methods: A keyword search of appropriate MeSH terms was initially undertaken to identify relevant material, after which the reference lists of manuscripts were also examined to locate further publications.

Results: A total of 81 English-language studies published in the past 30 years met the inclusion criteria. Two distinct trends were evident. Firstly, most developed countries have shown a steady decline in physicians' smoking rates during recent years. On the other hand, physicians in some developed countries and newly-developing regions still appear to be smoking at high rates. The lowest smoking prevalence rates were consistently documented in the United States, Australia and the United Kingdom. Comparison with other health professionals suggests that fewer physicians smoke when compared to nurses, and sometimes less often than dentists.

Conclusion: Overall, this review suggests that while physicians' smoking habits appear to vary from region to region, they are not uniformly low when viewed from an international perspective. It is important that smoking in the medical profession declines in future years, so that physicians can remain at the forefront of anti-smoking programs and lead the way as public health exemplars in the 21st century.

Background

Smoking represents a critical international issue for public health policy makers and strategists. According to the World Health Organisation, tobacco is the second major cause of death and the fourth most common risk factor for disease, worldwide. If current trends continue it will be causing around 10 million deaths each year by 2020, with approximately 650 million fatalities overall [1]. Smoking also represents a key issue in the medical profession, as physicians play a leading role in tobacco usage prevention in the community [2], and a key position in the development of overall public health policy. Medical professionals are on the frontlines of primary health care, and research has shown that medical interventions can be

effective in helping patients to quit smoking [3]. In this role, physicians are widely viewed as exemplars by the community, their patients and their colleagues. Indeed, the physicians' office and hospital should be a model of non-smoking behaviour [4], and, as early as 1976, it was suggested that physicians could best persuade patients to quit if they themselves did not smoke [5].

Aside from its significant impact on patients' health, tobacco usage also represents an important occupational health issue in the medical profession. According to the International Labour Office (ILO), the promotion of smoke-free environments forms a key part of any healthy and safe workplace [6]. Interestingly, some of the first epidemiological research demonstrating the adverse health effects of tobacco smoking was actually conducted among a cohort of British physicians [7]. So important was Doll and Hill's 1954 study of British doctors that it was republished by the British Medical Journal 50 years later [8] and remains a milestone in public health to this day [9-11]. Further research from the United States (US) also supported the preliminary British findings with regard to smoking hazards [12-14].

Although the dangers of smoking are now well-known throughout the medical profession, physicians have not always set a good example for patients [15]. In the 20th century for example, some physicians even *advertised* cigarettes [16,17]. Smoking rates among them were also quite high. Some of the earliest large-scale epidemiological research from the United States revealed that around 40% of physicians were smokers in 1959 [5], a figure which had fallen to 21% by the mid 1970s [18,19]. By the mid 1980s, around 17% of US physicians were still smoking cigarettes and 8% smoking pipes or cigars [20]. A large prospective study undertaken by the American Cancer Society in 1982 revealed a smoking prevalence rate of around 25% among physicians [21]. Subsequent National Health Interview Surveys found that the national smoking rate for physicians in the US had fallen dramatically between 1987 and 1994, and was below 10% by the mid 1990s [22-24]. Similar downward trends were also seen in Scandinavia [25] and the Netherlands [26,27] during the latter half of last century.

Although these investigations suggest that physicians' smoking rates are probably declining in many parts of the world, international trends have not been clearly elucidated. Furthermore, few, if any, researchers have comprehensively reviewed tobacco-smoking habits in the medical profession from a global perspective. This represents an unfortunate oversight in the literature, as data on physicians' smoking habits has at least two direct benefits for health care policy makers [15]. Firstly, it can help predict how effective any potential anti-smoking campaigns in the wider community might actually be. Secondly, and perhaps most importantly, contemporary tobacco usage data allows public health policy makers to determine how soon their overall community prevalence rate might decline [15]. Given such clear benefits, the aim of our investigation therefore, was to undertake a comprehensive review of international tobacco smoking surveys, which have been conducted among physicians over the past 30 years. The main research question was, what proportion of physicians are smoking in what countries, and how have their habits changed over time.

Methods

This study was conducted as an extensive international review targeting all manuscripts published in peer-reviewed journals relating to the topic of tobacco smoking among physicians. No unpublished articles were included. As the nature of research changes over time and results quickly go out of date, only manuscripts which had been published in the previous 30 years were included. As there is always some delay between conducting a study and actually having it published, the most recent investigations on this topic had been conducted in 2004, and thus the search criteria were limited to articles published between 1974 and 2004. For consistency, only English-language reports were included in the review. The literature review began in March 2006 with a Medline and CINAHL (Cumulative Index to Nursing and Allied Health Literature) internet search using the most appropriate Medical Subject Headings (MeSH) 'smoking', 'tobacco' and 'physician'. After identifying some initial studies, the search was repeated using the additional keyword variations of 'smoke' and 'doctor'. Manuscripts located using these initial criteria were subsequently examined to find additional publications in their reference list. A large proportion of manuscripts were eventually located using the latter method. Manuscripts were arranged in descending order, depending on the year in which the survey was undertaken, rather than the publication year. Where such information was unavailable, the corresponding author of the manuscript was contacted for clarification. In cases where contact with the authors was not possible or repeatedly unsuccessful, manuscripts were listed by year of publication and marked with an asterisk. If a study had been undertaken over the course of more than one year, then the most recent year was listed.

Manuscripts were assigned a reference number based on the abovementioned criteria. As the results of some investigations were published in more than one journal article, some studies have two to three corresponding references. Smoking rates were listed as the prevalence of smoking among the entire group, and also as prevalence rates for males and females. In cases where smoking prevalence rates by gender were not stated in the manuscript itself,

they were manually calculated whenever possible. For consistency, all smoking prevalence rates were rounded to the nearest whole number. Response rates for each study were also rounded to the nearest whole number for standardisation purposes. As some studies investigated multiple occupational groups that included physicians, some response rates were indicative of the entire group response, rather than just the physicians. Where authors had apparently used a convenience sample with an unspecified response rate, or the response rate was not listed, this information was also indicated on the table.

Results

A total of 81 published studies met the inclusion criteria [28-113], as shown in Table 1. Most (n = 48) had been conducted as postal surveys, 14 were hand delivered, 4 were telephone surveys, 4 had utilised census data, 3 were conducted by personal interview, and two had been conducted at conferences. A further 4 used both postal surveys and follow-up telephone interviews, while two used postal and hand delivery, mainly to increase response rates following the postal phase. The latter technique appears to have been quite successful in some cases, with one Malaysian study [76] achieving a 100% response rate in this regard. Response rates of the published studies ranged from 27% [101,102] to 100% [76], with most above 60%. Only four manuscripts had response rates below 50%, and three investigations did not list their response rate. One study from Iran appeared to have 100% participation [39], although a response rate was not clearly stated and the authors were unable to be contacted to clarify their result, despite repeated attempts. A similar situation was encountered with a Greek study [70], where no response rate was listed and the authors were unable to be contacted. Among all manuscripts included in the current review, sample sizes ranged from 45 [29] to 10 807 [77], with an encouraging proportion having over 1000 respondents. Particularly large surveys of physicians' tobacco smoking habits were published from the Doctor's Health Study in the United Kingdom [77], the Physicians Health Study in the United States [66-68], and also from New Zealand census data [54,106,111]; one of the few countries in the world which includes tobacco smoking questions on their census form [54].

One confounding factor across many investigations however, was a lack of standardisation regarding the definition of 'current smoker'. Although most authors referred to their subjects as simply being either smokers or non-smokers, some used recall periods ranging from one week to one month in their definition of the term 'current'. Others listed no recall period. This may have arisen due to the inherent difficulties in assessing smoking habits over time, and the fact that most investigations simply described the point-prevalence of tobacco smoking among the surveyed group. Not all physicians smoked cigarettes either, with a study of Hispanic physicians in the United States [29] finding that 7% of their subjects smoked cigars, and none smoked cigarettes. In 1990 Doll et al [77] also revealed that a large proportion of their British physicians only smoked pipes or cigars, similar to Fowler et al's [89] earlier finding in the same country. Another confounding factor was that some studies appeared to use convenience samples, rather than true random sampling. Furthermore, a certain proportion of manuscripts did not clearly describe their sample group or their entire research methodology in detail. Nevertheless, such investigations were in the minority, with a large proportion of all manuscripts located during this review having reasonable sample sizes in the hundreds, and sufficiently high response rates to allow confidence in the published data.

Discussion

A large proportion of all research on physicians' tobacco smoking (52 of 81 studies) appears to have been conducted since 1990 [28-81]. Twenty-three studies had been undertaken between 1980 and 1989 [82-107], with the remaining 6 investigations conducted prior to 1980 [108-113]. By country, 18 manuscripts in this review originated from the United States, 7 from Japan, 6 from Italy, 5 from the United Kingdom, 5 from Australia, 3 from New Zealand, and the remainder from other areas. When investigated from an international perspective, the overall prevalence of physician's smoking appears to have followed two distinct trends during this time. First of all, most developed countries appear to have experienced a steady decline in physicians' smoking rates over the past 30 years. Since the year 2000 for example, four separate studies [29,30,36,42] have shown the prevalence of smoking among American physicians to be lower than 10%.

Three investigations of their Australian counterparts in the 1990s [56-58] revealed a prevalence of around 5%, while in New Zealand, analysis of census data also suggested a similar rate during this period [54]. Tobacco use among British physicians has been well-studied longitudinally [10,11,77], although their smoking rate does not appear to be as low as the abovementioned countries, possibly due to the relatively large number who continue to smoke pipes and cigars, rather than cigarettes. Nevertheless, overall tobacco consumption has still declined markedly, with Doll et al [77] revealing that the absolute proportion of British physicians who smoked cigars, pipes or cigarettes fell from 62% to 18% between 1951 and 1990. As the British Doctor's Study follows the same cohort longitudinally, this represents one of the clearest reductions in absolute tobacco smoking rates among physicians.

Table 1: International Comparison of Tobacco Smoking Surveys Conducted among Physicians between 1974 and 2004

Publication Details			Smoking Rate[c]			Study Details			
Authors [a]	Year [b]	Country	All	Male	Female	Methodology	Sample Size	Response Rate [d]	Additional Findings
Smith et al [28]	2004	China	16%	32%	0%	Hand Delivered	286	79%	Physicians younger than 25 had the lowest smoking rate
Soto Mas et al [29]	2003	United States [e]	7%	-	-	Postal Survey	45	56%	No physicians reported being current *cigarette* smokers
Kenna & Wood [30]	2002	United States	4%	-	-	Postal Survey	104	63%	Fewer physicians smoked when compared to dentists
Pärna et al [31,32]	2002	Estonia	-	25%	11%	Postal Survey	2668	68%	Twice as many males as females were ex-smokers
Hodgetts et al [33]	2002	Bosnia & Herzegovina	40%	-	-	Hand Delivered	112	73%	Fewer physicians smoked when compared to nurses
Gunes et al [34]	2002	Turkey	38%	-	-	Hand Delivered	257	85%	Around one-fifth of smokers were only occasional smokers
Nollen et al [35]	2002	Nigeria	3%	-	-	Hand Delivered	373	60%	Smoking rates in two different hospitals were the same
Misra & Vadaparampil [36]	2002	United States [f]	3%	-	-	Postal Survey	254	37%	The smoking status of a further 6% of physicians was not defined
Barengo et al [37]	2001	Finland	-	5%	3%	Postal Survey	3057	69%	Occasional smoking was more common among male physicians
Kannegaard et al [38]	2001	Denmark	15%	-	-	Postal Survey	729	75%	The physicians' smoking rate fell 4% between 1999 and 2001
Ahmadi et al [39]	2001*	Iran	9%	-	-	Hand Delivered	111	n/s[g]	Residents had a higher smoking rate than attending physicians
Pizzo et al [40]	2000	Italy	28%	32%	20%	Telephone Survey	526	72%	Physician smoking rates differed by geographical region
Ohida et al [41]	2000	Japan	-	27%	7%	Postal Survey	3771	84%	Male physicians aged 40–49 had the highest smoking rate
An et al [42]	2000	United States	2%	-	-	Postal Survey	750	61%	A further 17% of physicians had ever smoked in the past
John & Hanke [43]	1999	Germany	18%	-	-	Census Data	1144	79%	Fewer physicians smoked when compared to nurses
La Vecchia et al [44]	1999	Italy	24%	25%	23%	Interview	501	n/s	Physicians aged 41–50 had the highest smoking rate
Power et al [45]	1999	Ireland	16%	-	-	Telephone Survey	171	85%	Most physicians understood the dangers of smoking
Williang et al [46]	1999	Denmark	25%	-	-	Postal Survey	445	91%	Fewer physicians smoked when compared to nurses
McEwan & West [47]	1999	United Kingdom	4%	-	-	Postal and Telephone	303	75%	Most physicians felt they should advise patients to quit
Nardini et al [48]	1998*	Italy	39%	-	-	Hand Delivered	959	57%	Fewer physicians smoked when compared to nurses
Josseran et al [49]	1998	France	32%	34%	25%	Telephone Survey	2073	67%	Physicians older than 40 had the highest smoking rate
Hepburn et al [50]	1997	United States	11%	-	-	Postal Survey	150	65%	More than half of the smokers used smokeless tobacco
Kawahara et al [51]	1997	Japan	26%	28%	5%	Postal Survey	709	91%	Physicians aged 40–49 years had the highest smoking rate
Samuels [52]	1996	Israel	16%	16%	15%	Interview	260	87%	The highest smoking rate was seen among radiologists
Zanetti et al [53]	1996	Italy	31%	29%	34%	Hand Delivered	2453	68%	Fewer physicians smoked when compared to nurses
Hay [54]	1996	New Zealand	5%	5%	5%	Census Data	7335	97%[h]	Fewer physicians smoked when compared to nurses
Li et al [55]	1996	China	45%	61%	12%	Hand Delivered	493	82%	Smoking rates have increased dramatically in recent years
Young & Ward [56]	1996	Australia	3%	4%	2%	Postal Survey	855	67%	Older physicians were more likely to be current smokers
Roche et al [57]	1996*	Australia	4%	-	-	Postal Survey	908	55%	A further 8% said they had previously smoked tobacco
Roche et al [58]	1995*	Australia	6%	6%	5%	Postal Survey	1365	55%	Trainee psychiatrists were more likely to be smokers
Barengo et al [59]	1995	Finland	-	7%	3%	Postal Survey	1221	76%	Male physicians older than 45 had the highest smoking rate
Nardini et al [60]	1995	Italy	25%	-	-	Conference Survey	605	62%	Physicians aged 40–50 years had the highest smoking rate

Table 1: International Comparison of Tobacco Smoking Surveys Conducted among Physicians between 1974 and 2004 *(Continued)*

Hill & Braithwaite [61]	1994	United States [1]	4%	-	-	Postal Survey	121	32%	Fewer physicians smoked when compared to dentists
Kawane & Soejima [62]	1994	Japan	29%	-	-	Hand Delivered	163	60%	Younger physicians had the highest smoking rates
Josseran et al [63]	1994	France	34%	36%	25%	Telephone Survey	1013	65%	Male physicians were also heavier smokers than female physicians
Kawakami et al [64]	1994	Japan	21%	24%	7%	Postal Survey	323	71%	Only 60% of smokers intended to reduce or quit their habit in future
Grossman et al [65]	1994	Costa Rica	19%	-	-	Hand Delivered	217	76%	88% of smokers intended to reduce or quit their habit in future
Frank et al [66–68]	1994	United States	-	-	4%	Postal Survey	4501	59%	Fewer family physicians smoked than physicians, generally
Tapia-Conyer et al [69]	1993	Mexico	27%	30%	21%	Postal Survey	3488	98%	Physicians aged 33–43 years had the highest smoking rate
Polyzos et al [70]	1992	Greece	49%	-	-	Hand Delivered	148	n/s	Surgeons had a higher smoking rate than internists
Heloma et al [71]	1992	Finland	10%	-	-	Postal Survey	725	72%	More physicians smoked when compared to nurses
De Koninck et al [72]	1992	Canada	-	13%	7%	Postal Survey	1540	51%	Over half of all male physicians had previously smoked
Bener et al [73]	1992	Arab Emirates	36%	44%	8%	Postal Survey	275	92%	Almost half the smokers were aged over 45 years
Tessier et al [74]	1991	France	21%	22%	14%	Postal Survey	4318	37%	Over half had made at least one attempt to quit smoking
Hussain et al [75]	1991	United Kingdom	5%	-	-	Postal Survey	1069	82%	Fewer physicians smoked when compared to nurses
Yaacob & Abdullah [76]	1991	Malaysia	18%	25%	0%	Postal and Hand Delivered	120	100%	Around half the smokers had begun before medical school
Doll et al [77]	1990	United Kingdom	-	18%	-	Postal Survey	10807	94%	A large proportion of smokers only smoked pipes and cigars
Kaetsu et al [78]	1990	Japan	32%	33%	5%	Postal Survey	3565	63%	Male physicians younger than 40 had the highest smoking rate
Jormanainen et al [79]	1990	Finland	-	10%	6%	Postal Survey	1231	76%	General practitioners had a higher smoking rate than specialists
Brink et al [80]	1990	United States	2%	-	-	Postal Survey	132	77%	Physicians smoked at similar rates when compared to dentists
Bener et al [73]	1990	Kuwait	38%	45%	16%	Postal Survey	252	84%	Over half the smokers were aged 35 to 44 years
Hensrud & Sprafka [81]	1990	United States	9%	10%	2%	Postal Survey	393	83%	Physicians aged 60–69 years had the highest smoking rate
Waalkens et al [82]	1989	The Netherlands	32%	37%	14%	Postal Survey	362	63%	More consultants smoked than house officers
Kawane [83–85]	1989	Japan	25%	26%	6%	Postal Survey	3640	59%	Chest physicians smoked at lower rates than physicians, generally
Dekker et al [86]	1989	Netherlands	38%	41%	24%	Postal Survey	263	82%	More general practitioners smoked than consultants
Hughes et al [87]	1989	United States	6%	-	-	Postal Survey	5426	59%	Older physicians were more likely to have ever smoked
Scott et al [88]	1988	United States	5%	5%	4%	Postal Survey	2341	86%	Physicians aged 55–64 years had the highest smoking rate
Fowler et al [89]	1988	United Kingdom	4%	-	-	Postal Survey	2176	75%	A further 11% of male physicians smoked pipes or cigars
Saeed [90]	1987	Saudi Arabia	34%	-	-	Hand Delivered	716	81%	Males smoked more sticks per day than female physicians
Nutbeam & Catford [91]	1987	Wales	14%	17%	0%	Postal Survey	310	60%	Almost one-quarter of female physicians were ex-smokers
Hughes et al [92]	1987	United States	4%	-	-	Postal Survey	1754	60%	Psychiatry residents had the highest smoking rate
Davies & Rajan [93]	1987	United Kingdom	3%	-	-	Postal Survey	94	72%	Fewer physicians smoked when compared to nurses
Cheng & Lam [94]	1987	Hong Kong	5%	7%	0%	Postal Survey	133	88%	Only 8% of female physicians had ever smoked tobacco
Stillman et al [95]	1987	United States	6%	-	-	Postal Survey	6050	69%	A no-smoking hospital policy helped reduce the smoking rate

Table 1: International Comparison of Tobacco Smoking Surveys Conducted among Physicians between 1974 and 2004 *(Continued)*

Sarkar et al [96]	1987	India	32%	48%	3%	Interview	218	99%	Physicians aged 20–29 had the highest smoking rate
Franceschi et al [97]	1985	Italy	31%	-	-	Postal and Telephone	709	86%	Over half of the smokers reported no attempt to quit smoking
Linn et al [98]	1984	United States	4%	-	-	Postal and Telephone	211	67%	A further 2% smoked either weekly or monthly
Joossens et al [99]	1983	Belgium	32%	34%	16%	Postal Survey	2157	67%	Around half of the smokers were evaluated as being dissonant
Kaetsu et al [100]	1983	Japan	43%	45%	9%	Postal Survey	4232	84%	Male physicians younger than 40 had the highest smoking rate
Sachs [101,102]	1983	United States	12%	-	-	Conference Survey	594	27%	Smoking was higher among non-practicing specialists
Seiler [103]	1983*	Scotland	19%	-	-	Postal Survey	607	81%	Almost half of smoking doctors had spouses who also smoked
Senior [104]	1982*	Canada	19%	-	-	Hand Delivered	88	52%	Fewer physicians smoked when compared to nurses
Fortmann et al [105]	1982	United States	8%	-	-	Postal Survey	221	62%	Physicians older than 46 years had the highest smoking rate
Hay [106]	1981	New Zealand	15%	15%	13%	Census Data	4937	97%[h]	Fewer physicians smoked when compared to nurses
Ballal [107]	1980	Sudan	-	46%	1%	Postal and Hand Delivered	753	72%	Some respiratory symptoms were more common among smokers
Wyshak et al [108]	1979	United States	14%	-	-	Postal Survey	289	70%	Fewer physicians smoked when compared to lawyers
Wells et al [109]	1978	United States	-	15%	-	Hand Delivered	151	76%	Surgeons/obstetricians had the highest smoking rates
Dodds et al [110]	1977	Australia	21%	22%	16%	Postal and Telephone	275	80%	Physicians aged 50–59 years had the highest smoking rate
Hay [111]	1976	New Zealand	-	20%	17%	Census Data	4089	97%[h]	Obstetricians had the highest smoking rates of all
Aarø et al [112]	1974	Norway	-	35%	22%	Postal Survey	1138	95%	Male physicians aged 55–64 had the highest smoking rate
Rankin et al [113]	1974	Australia	14%	14%	17%	Postal Survey	1276	69%	Physicians aged 50–59 years had the highest smoking rate

[a] Including the reference number as listed in this manuscript, [b] Year in which the study was undertaken – not the year of publication (Studies that continued over more than one year list the latest year. In cases where the study year was not listed, manuscripts are arranged by publication year and marked with an asterisk*), [c] Smoking rates rounded to the nearest whole number, [d] Response rates rounded to the nearest whole number (as some studies investigated multiple occupational groups, response rates may be indicative of the entire group rather than just physicians), [e] Subjects were restricted to Hispanic physicians living in the United States, [f] Subjects were restricted to Asian-Indian physicians living in the United States, [g] The survey used a convenience sample with an unspecified response rate, [h] Response rate of the entire census, [i] Subjects were restricted to African-American physicians living in the United States

According to our review, such trends may not be uniform across all countries however, with physicians in some developed regions still smoking at fairly high rates. Multiple investigations from Italy [40,48,53], Japan [41,51,62,78,83-85,100] and France [49,63] for example, have consistently documented smoking prevalence rates over 25%. A second trend is also evident in some newly developing countries, where contemporary physicians appear to be smoking at high rates in China [55], Estonia [31,32], Bosnia/Herzegovina [33] and Turkey [34]. In China for example, Li et al [55] reported that tobacco smoking rates among physicians have actually been increasing in recent years. A surprisingly low rate was found in Nigeria however (3%) [35], suggesting that exceptions are still possible in this latter group. The lowest overall smoking rate was documented in the United States (2%) [42,80], with similar low rates also being demonstrated in Australia (3%) [56] and the United Kingdom (3%) [93]. The highest smoking prevalence rate was recorded in Greece [70], where roughly half of all physicians (49%) reported themselves to be current smokers. Almost half of all Chinese (45%) [55] and Japanese physicians (43%) [100] were revealed to be current smokers in two separate studies. Similar results were also documented in Kuwait (38%) and the United Arab Emirates (36%) [73], particularly among males (among whom 45% and 44% smoked, respectively). Almost half (48%) of all male Indian physicians from one study [96] were smoking. The proportion of ex-smoking physicians is also worth considering, with prevalence rates of 8% in Australia [57], 17% in the United States [42], 23% in Wales [91] and 52% in Canada [72], being previously documented.

For current smokers by gender, the highest smoking prevalence rates were 61% among male physicians in China [55] and 34% among female physicians in Italy [53]. Two investigations from France also found that one-quarter of their female physicians smoked tobacco on a regular basis [49,63]. Conversely, other research from China [28], Malaysia [76], Wales [91] and Hong Kong [94] revealed no female smokers at all. This may suggest a cultural reluctance for professional women to smoke in certain regions, such as Asia. An important observation during our review was the relatively large number of studies where male physicians smoked at higher rates than their female counterparts. This finding was not without exception however. In Italy for example, Zanetti et al [53] found that more women doctors smoked than men, while in Israel [52], Australia [58] and the United States [88], smoking prevalence rates were almost the same between the genders. A large proportion of manuscripts did not divide their smoking prevalence rates by sex however, making it impossible to do further gender comparisons. Many authors documented age-related differences in physicians' smoking rates, with older physicians for the most part, more likely to be current smokers. Nevertheless, in China [28], Japan [62,100], Mexico [69] and India [96], tobacco usage was actually more prevalent in younger physicians. This latter result suggests that a challenge for public health policy makers in countries with high smoking rates among young physicians, still lies ahead.

Aside from overall prevalence rates, additional useful information was also obtained with regard to physician's tobacco smoking habits. Firstly, some studies simultaneously investigated the tobacco usage habits of dentists, nurses and other hospital staff while surveying doctors. Two investigations from the United States [30,61] found that fewer physicians smoked when compared to dentists, while another study demonstrated very similar, albeit very low, smoking rates among the two professional groups [80]. In 1979, Wyshak et al [108] found that physicians were less likely to be current smokers than lawyers. Most studies found that fewer physicians smoked when compared to nurses at the same facility, although an investigation from Finland [71] suggested the opposite situation may sometimes occur. Even so, physicians in most societies tend to give up smoking before other occupational groups and the general public for a number of reasons [15]. Firstly, they may recognise the negative medical consequences more quickly than the general public. Secondly, their devotion to health naturally conflicts with unhealthy behaviours. Thirdly, tobacco smoking usually incurs a negative image in the health-care profession long before it does so in the wider community [15]. In this regard, doctors are well-equipped to evaluate scientific knowledge, and can be reasonably expected to act upon new discoveries, if warranted [114]. Furthermore, smoking rates in developed countries tend to decrease over time due to a generational effect, as the social climate of a country changes and more people give up smoking, doctors included [86].

Tobacco smoking by medical speciality also revealed some interesting, though inconsistent, results during this review. One study for example, found that family physicians smoked less than physicians generally [67], while two others suggested that general practitioners smoked more often than specialists [79,86]. In the Netherlands, more consultants smoked than house officers [82]. Trainee psychiatrists [58] and psychiatry residents [92] were the most likely to smoke in some investigations, while in others it was surgeons [70], obstetricians [111] or surgeons and obstetricians [109]. Encouragingly, Kawane et al [83-85] demonstrated that Japanese chest physicians had a lower smoking rate than Japanese physicians, generally. Exactly how much a physician's medical speciality influences their smoking habits is uncertain. A previous study of Malaysian doctors for example [76] found that

around half were already smoking before they entered medical school. Based on the findings of multiple investigations therefore, it is very difficult to ascertain which medical speciality actually has the highest or lowest smoking rate.

Regarding antismoking practices, most physicians in a British study [47] felt they should advise patients to quit, and in France [74] over half the tobacco using physicians had made at least one serious attempt to quit smoking themselves. In Italy however [97], more than half the physicians who currently smoked had made no attempt to quit smoking, and in Japan [64] only 60% of smokers stated any intention of reducing their tobacco consumption or quitting altogether. Other authors have already suggested that Japanese physicians may not be setting a good example in this regard [115]. The institutions where doctors work may also play an important role in tobacco control, with an American study [95] demonstrating that a hospital no-smoking policy was useful in helping to reduce the overall smoking rate among staff. Hospitals in the United States were the first industry to declare a national smoking ban in the early 1990s, and ones which later influenced social norms and probably reduced overall smoking rates [116]. Even so, the actual hospital in which physicians work, as well as the geographical location where they live, may not always affect the smoking rates of physicians in the same country. One Italian study for example, found different smoking rates by region [40], although in Nigeria [35] smoking rates of physicians in two different hospitals were exactly same, with both being encouragingly low (3%). A doctor's smoking habit may also be associated with the smoking habits of their spouse. Previous studies from Scotland [103] and New Zealand [117] for example, revealed that around half of all male physicians who smoked, also had smoking wives. This situation may reflect assortative mating and its subsequent influence on partner choice, at least with regard to smoking.

How much a physician's personal smoking behaviour affects their professional attitude and clinical behaviour represents a critical issue in public health policy, as physicians are on the frontlines of primary health care. Although medical professionals have many opportunities to reduce the prevalence of smoking among their patients, physicians may have not yet maximized their efforts in meeting the tobacco epidemic. Doctors incur a certain responsibility as exemplars for patients with regard to healthy behaviour [118], as well as the public image they inadvertently portray outside of the work environment [119]. Having any physicians who smoke may increase public scepticism, with people inclined to ask why should they stop smoking when their doctor continues to do so? [120]. Continued tobacco usage by health care workers undermines the message to smokers that quitting is important [121], and as early as 1976 it was suggested that physicians could best persuade patients to quit if they themselves did not smoke [5]. In 1983, Sachs [101] stated that 80% of US citizens expected their physicians to be non-smokers, and in 1984, Wells et al [109] suggested that physicians with good personal health habits counselled their patients significantly more about all health habits. As physicians gain more insight into their own health and health habits, their advice to patients becomes increasingly relevant and effective [122]. Although methods for treating tobacco dependence in clinical practice have been described elsewhere [123-125], the entire process need not be overly taxing for physicians. At the most basic level, such interventions may require them to ask only two questions: 'do you smoke?' and 'do you want to quit?' [123]. Nevertheless, such guidelines are not always followed for a variety of reasons.

The extent to which the professional practice of physicians is affected by their own smoking habits is very important for policymakers, and has been examined in certain investigations. One of the most marked differences in this regard was found in Greece [70], where only half the smoking physicians were involved in smoking cessation counselling, compared to 100% of their non-smoking colleagues. Several Japanese studies revealed differences in smoking-cessation advice [64] and taking a patients' smoking history [51], with both being significantly more commonplace among non-smoking physicians. Similar findings were also seen in Finland [37], while Pärna et al [31] revealed that Estonian physicians who smoked were reluctant to disturb a patient's privacy by asking about their tobacco usage. Knowledge of smoking-related damage also showed correlations with smoking behaviour in an Italian study [48], although their analysis included other health professionals as well as physicians.

Not all studies revealed differences however. In Israel for example, Samuels [52] asked physicians whether or not they advised patients to stop smoking during consultations, and found no difference between smokers and non-smokers. A longitudinal study of Chinese physicians also revealed that the effects of smoking on counselling behaviour varied between 1987 and 1996 [55]. In 1987 for example, smoking behaviour was an influential factor, whereas by 1996 it had ceased to be so. Other confounding issues were raised by the Chinese study. Firstly, only one-third of physicians believed that they were the most influential person who could help patients quit. On the other hand, over three-quarters of them believed that physicians can set a good example for patients by not smoking. Most disturbingly, anti-smoking counselling practices appear to be diminishing among Chinese physicians in recent years, while their overall prevalence of smoking is

probably increasing during the same time [55]. These discrepancies between various countries suggest that not only are physician-targeted smoking interventions urgently needed in public health, but that they should also be culturally specific.

Although our current review sourced a wide variety of manuscripts from many countries, there are a few limitations worth considering. Firstly, for practical reasons, only English language papers were included. With such a methodology, it is possible that we may have missed some manuscripts published in domestic journals and local languages. The decision to restrict our study to English language papers was a purely pragmatic one, however. We felt that formulating inclusion criteria for other languages would have been too difficult to practically achieve, given the wide variety of dialects in which contemporary research is now being published. Furthermore, including some languages but not others would also have led to a bias against manuscripts written in languages that the authors could not understand. Secondly, we assumed that, knowing the topic's importance, significant domestic findings would most likely have been published in an international, English language journal.

Nevertheless, the nature of biomedical publication itself is known to incur some inherent bias against developing countries, and this will probably be reflected in the overall number of publications available from those regions. As previously noted by Rahman and Fukui [126], the imbalance between developing and developed countries in terms of biomedical publication is not only significant, but the total share of publications originating from low-income countries may also be declining in recent years. This limitation in data equity makes it difficult to unequivocally decide why smoking rates differ between physicians in developed and developing countries. Given that such limitations occur, it is important that continued measures be taken to encourage local researchers, irrespective of nationality, to publish their findings in a globally accessible format. Furthermore, it is imperative that the knowledge gained from international smoking research be equally and consistently disseminated to physicians and other public health policy makers in all countries.

A further difficulty encountered during this review was ascertaining exactly how comparable the smoking prevalence data is from country to country, and also from study to study in the same country. As previously mentioned, one issue we encountered early on was the definition of the term 'smoker' that researchers had actually used. Another issue is reflected in the changing nature of survey methodologies, even in the same country, combined with the fact that many surveys are not originally designed for a comparative analysis of smoking rates at a later date; a point acknowledged by certain authors of longitudinal data [43]. Probably the best study with longitudinal smoking data is still the British Doctor's Study [77], which has followed the same cohort of physicians for over 50 years. Future researchers investigating the smoking habits of health care workers would do well to follow this pioneering model.

Conclusion

Regardless of what country the data originates from, tobacco smoking by physicians remains a contentious issue in public health. Global policy making demands accurate data on this topic, from which at least two distinct benefits can be derived. Firstly, this kind of data can help predict how effective any potential anti-smoking campaigns may actually be in a particular country [15]. That is, it would be difficult to convince the general public not to smoke if their physician role-models continue to do so. Secondly, and perhaps most importantly, it allows public health policy makers to determine how 'mature' a country's smoking epidemic currently is, and thus, how soon the overall community prevalence rate could be expected to decline. The current paper presented an international review of all modern literature concerning tobacco usage patterns within the medical profession. Overall, our review suggests that smoking rates in this professional group vary widely from region to region. International policy makers who are attempting to tackle the tobacco problem on a global scale, such as the WHO, will need to carefully consider these regional differences when devising potential control strategies. In this regard, high smoking rates among doctors in some countries for example, suggests that physicians may not always be the best role models from where sound policy can actually originate.

On the other hand, comparison of physician's smoking rates with other health professionals suggests that fewer doctors seem to be smoking when compared to nurses in the same countries. In addition to physicians, it has also been shown that smoking is now becoming quite rare among dentists in many areas [127]. Dentists may therefore be ideally placed to work with physicians in helping to reduce the overall burden of tobacco use among patients. A multidisciplinary effort from all health care workers would seem to be an ideal goal, from a global perspective. Nevertheless, the fact that any health care workers smoke at all is unfortunate, given their undoubted status as public health exemplars. As such, further preventive efforts will need to be focussed on the personal health behaviours of physicians, particularly those in developing countries. To assist in the promotion of sound public health policy, it is important that physician's tobacco usage continues its decline in future years, so that the medical profession can remain at the forefront of anti-

smoking programs and lead the way as public health exemplars in the 21st century.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

DRS conceived the idea for the paper. DRS and PAL contributed equally to the literature search. Both DRS and PAL contributed to the evaluation of the literature. DRS drafted the manuscript. Both authors reviewed and approved the final manuscript.

References

1. World Health Organization (WHO): *Why is tobacco a public health priority?* [http://www.who.int/tobacco/health_priority/en/index.html]. (accessed June 2006)
2. Centers for Disease Control and Prevention (CDC): **Physician and other health-care professional counseling of smokers to quit – United States, 1991.** *MMWR Morb Mortal Wkly Rep* 1993, **42**:854-857.
3. Fowler G: **Educating doctors in smoking cessation.** *Tob Control* 1993, **2**:5-6.
4. Nett LM: **The physician's role in smoking cessation: A present and future agenda.** *Chest* 1990, **97(Suppl 2)**:28S-32S.
5. Garfinkel L: **Cigarette smoking among physicians and other health professionals, 1959–1972.** *CA Cancer J Clin* 1976, **26**:373-375.
6. Häkansta C: *Workplace Smoking. Working Paper: A review of national and local practical and regulatory measures* Geneva: International Labor Office (ILO); 2004:1-89.
7. Doll R, Hill AB: **The mortality of doctors in relation to their smoking habits: A preliminary report.** *BMJ* 1954, **1(4877)**:1451-1455.
8. Doll R, Hill AB: **The mortality of doctors in relation to their smoking habits: A preliminary report. 1954.** *BMJ* 2004, **328**:1529-1533.
9. Stampfer M: **New insights from the British doctors study.** *BMJ* 2004, **328**:1507.
10. Doll R, Peto R, Boreham J, Sutherland I: **Mortality in relation to smoking: 50 years' observations on male British doctors.** *BMJ* 2004, **328**:1519-1528.
11. Doll R, Peto R, Boreham J, Sutherland I: **Mortality from cancer in relation to smoking: 50 years observations on British doctors.** *Br J Cancer* 2005, **92**:426-429.
12. Hammond EC, Horn D: **Smoking and death rates – Report on forty-four months of follow-up of 187,783 men. I: Total mortality.** *JAMA* 1958, **166(10)**:1159-1172.
13. Hammond EC, Horn D: **Smoking and death rates – Report on forty-four months of follow-up of 187,783 men. II: Death rates by cause.** *JAMA* 1958, **166**:1294-1308.
14. Hammond EC, Horn D: **Landmark article March 15, 1958: Smoking and death rates – Report on forty-four months of follow-up of 187,783 men. By E. Cuyler Hammond and Daniel Horn.** *JAMA* 1984, **251**:2840-2853.
15. Davis RM: **When doctors smoke.** *Tob Control* 1993, **2**:187-188.
16. Gardner MN, Brandt AM: **The Doctors' Choice Is America's Choice: The Physician in US Cigarette Advertisements, 1930–1953.** *Am J Public Health* 2006, **96**:222-232.
17. Kawane H: **When doctors advertised cigarettes.** *Tob Control* 1993, **2**:45.
18. Centers for Disease Control and Prevention (CDC): **Smoking behavior and attitudes of physicians, dentists, nurses, and pharmacists, 1975.** *MMWR Morb Mortal Wkly Rep* 1977, **26**:185.
19. Sterling TD, Weinkam JJ: **Smoking characteristics by type of employment.** *J Occup Med* 1976, **18**:743-754.
20. Garfinkel L, Stellman SD: **Cigarette smoking among physicians, dentists, and nurses.** *CA Cancer J Clin* 1986, **36**:2-8.
21. Stellman SD, Boffetta P, Garfinkel L: **Smoking habits of 800 000 American men and women in relation to their occupations.** *Am J Ind Med* 1988, **13**:43-58.
22. Nelson DE, Giovino GA, Emont SL, Brackbill R, Cameron LL, Peddicord J, *et al.*: **Trends in cigarette smoking among US physicians and nurses.** *JAMA* 1994, **271**:1273-1275.
23. Nelson DE, Emont SL, Brackbill RM, Cameron LL, Peddicord J, Flore MC: **Cigarette smoking prevalence by occupation in the United States. A comparison between 1978 to 1980 and 1987 to 1990.** *J Occup Med* 1994, **36**:516-525.
24. Lee DJ, LeBlanc W, Fleming LE, Gomez-Marin O, Pitman T: **Trends in US smoking rates in occupational groups: The National Health Interview Survey 1987–1994.** *J Occup Environ Med* 2004, **46**:538-548.
25. van Reek J, Adriaanse H: **Smoking by physicians in Scandinavia: 1952–1989.** *Scand J Soc Med* 1991, **19**:256-259.
26. Adriaanse H, van Reek J, Metsemakers J: **Smoking behaviour of Dutch general practitioners in the period 1977–1983.** *Scand J Prim Health Care* 1986, **4**:151-156.
27. Adriaanse H, Halfens R, Drop MJ, van Reek J: **Physicians, smoking, and health in the Netherlands.** *NY State J Med* 1985, **85(7)**:394-395.
28. Smith DR, Wei N, Zhang YJ, Wang RS: **Tobacco smoking habits among a cross-section of rural physicians in China.** *Aust J Rural Health* 2006, **14**:66-71.
29. Soto Mas FG, Papenfuss RL, Jacobson HE, Hsu CE, Urrutia-Rojas X, Kane WM: **Hispanic physicians' tobacco intervention practices: A cross-sectional survey study.** *BMC Public Health* 2005, **5**:120.
30. Kenna GA, Wood MD: **The prevalence of alcohol, cigarette and illicit drug use and problems among dentists.** *J Am Dent Assoc* 2005, **136**:1023-1032.
31. Parna K, Rahu K, Rahu M: **Smoking habits and attitudes towards smoking among Estonian physicians.** *Public Health* 2005, **119**:390-399.
32. Parna K, Rahu K, Barengo NC, Rahu M, Sandstrom PH, Jormanainen VJ, *et al.*: **Comparison of knowledge, attitudes and behaviour regarding smoking among Estonian and Finnish physicians.** *Soz Praventivmed* 2005, **50**:378-388.
33. Hodgetts G, Broers T, Godwin M: **Smoking behaviour, knowledge and attitudes among Family Medicine physicians and nurses in Bosnia and Herzegovina.** *BMC Fam Pract* 2004, **5**:12.
34. Gunes G, Karaoglu L, Genc MF, Pehlivan E, Egri M: **University hospital physicians' attitudes and practices for smoking cessation counseling in Malatya, Turkey.** *Patient Educ Couns* 2005, **56**:147-153.
35. Nollen NL, Adewale S, Okuyemi KS, Ahluwalia JS, Parakoyi A: **Workplace tobacco policies and smoking cessation practices of physicians.** *J Natl Med Assoc* 2004, **96**:838-842.
36. Misra R, Vadaparampil ST: **Personal cancer prevention and screening practices among Asian Indian physicians in the United States.** *Cancer Detect Prev* 2004, **28**:269-276.
37. Barengo NC, Sandstrom HP, Jormanainen VJ, Myllykangas M: **Attitudes and behaviours in smoking cessation among general practitioners in Finland 2001.** *Soz Praventivmed* 2005, **50**:355-360.
38. Kannegaard PN, Kreiner S, Gregersen P, Goldstein H: **Smoking habits and attitudes to smoking 2001 among hospital staff at a Danish hospital – Comparison with a similar study 1999.** *Prev Med* 2005, **41**:321-217.
39. Ahmadi J, Khalili H, Jooybar R, Namazi N, Aghael PM: **Cigarette smoking among Iranian medical students, resident physicians and attending physicians.** *Eur J Med Res* 2001, **6**:406-408.
40. Pizzo AM, Chellini E, Grazzini G, Cardone A, Badellino F: **Italian general practitioners and smoking cessation strategies.** *Tumori* 2003, **89**:250-254.
41. Ohida T, Sakurai H, Mochizuki Y, Kamal AM, Takemura S, Minowa M, *et al.*: **Smoking prevalence and attitudes toward smoking among Japanese physicians.** *JAMA* 2001, **285**:2643-2648.
42. An LC, Bernhardt TS, Bluhm J, Bland P, Center B, Ahluwalia JS, *et al.*: **Treatment of tobacco use as a chronic medical condition: Primary care physicians' self-reported practice patterns.** *Prev Med* 2004, **38**:574-585.
43. John U, Hanke M: **Tobacco-smoking prevalence among physicians and nurses in countries with different tobacco-control activities.** *Eur J Cancer Prev* 2003, **12**:235-237.

44. La Vecchia C, Scarpino V, Malvezzi I, Baldi G: **A survey of smoking among Italian doctors.** *J Epidemiol Community Health* 2000, **54**:320.
45. Power B, Neilson S, Perry IJ: **Perception of the risks of smoking in the general population and among general practitioners in Ireland.** *Ir J Med Sci* 2004, **173**:141-144.
46. Willaing I, Jørgensen T, Iversen L: **How does individual smoking behaviour among hospital staff influence their knowledge of the health consequences of smoking?** *Scand J Public Health* 2003, **31**:149-155.
47. McEwen A, West R: **Smoking cessation activities by general practitioners and practice nurses.** *Tob Control* 2001, **10**:27-32.
48. Nardini S, Bertoletti R, Rastelli V, Ravelli L, Donner CF: **Personal smoking habit and attitude toward smoking among the health staff of a general hospital.** *Monaldi Arch Chest Dis* 1998, **53**:74-78.
49. Josseran L, King G, Guilbert P, Davis J, Brucker G: **Smoking by French general practitioners: Behaviour, attitudes and practice.** *Eur J Public Health* 2005, **15**:33-38.
50. Hepburn MJ, Johnson JM, Ward JA, Longfield JN: **A survey of smoking cessation knowledge, training, and practice among U.S. Army general medical officers.** *Am J Prev Med* 2000, **18**:300-304.
51. Kawahara K, Ohida T, Osaki Y, Mochizuki Y, Minowa M, Yamaguchi N, *et al.*: **Study of the smoking behavior of medical doctors in Fukui, Japan and their antismoking measures.** *J Epidemiol* 2000, **10**:157-162.
52. Samuels N: **Smoking among hospital doctors in Israel and their attitudes regarding anti-smoking legislation.** *Public Health* 1997, **111**:285-288.
53. Zanetti F, Gambi A, Bergamaschi A, Gentilini F, De Luca G, Monti C, *et al.*: **Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff.** *Public Health* 1998, **112**:57-62.
54. Hay DR: **Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census.** *NZ Med J* 1998, **111(1062)**:102-104.
55. Li HZ, Fish D, Zhou X: **Increase in cigarette smoking and decline of anti-smoking counselling among Chinese physicians: 1987–1996.** *Health Prom Int* 1999, **14**:123-131.
56. Young JM, Ward JE: **Declining rates of smoking among medical practitioners.** *Med J Aust* 1997, **167**:232.
57. Roche AM, Parle MD, Saunders JB: **Managing alcohol and drug problems in general practice: A survey of trainees' knowledge, attitudes and educational requirements.** *Aust NZ J Public Health* 1996, **20(4)**:401-408.
58. Roche AM, Parle MD, Stubbs JM, Hall W, Saunders JB: **Management and treatment efficacy of drug and alcohol problems: What do doctors believe?** *Addiction* 1995, **90**:1357-1366.
59. Barengo NC, Sandstrom PH, Jormanainen VJ, Myllykangas MT: **Changes in smoking prevalence among Finnish physicians 1990–2001.** *Eur J Public Health* 2004, **14**:201-203.
60. Nardini S, Bertoletti R, Rastelli V, Donner CF: **The influence of personal tobacco smoking on the clinical practice of Italian chest physicians.** *Eur Respir J* 1998, **12**:1450-1453.
61. Hill HA, Braithwaite RL: **Attitudes, beliefs, and practices regarding smoking and smoking cessation among African-American physicians and dentists.** *J Natl Med Assoc* 1997, **89**:745-751.
62. Kawane H, Soejima R: **Smoking among doctors in a medical school hospital.** *Kawasaki Med J* 1996, **22**:211-216.
63. Josseran L, King G, Velter A, Dressen C, Grizeau D: **Smoking behavior and opinions of French general practitioners.** *J Natl Med Assoc* 2000, **92**:382-390.
64. Kawakami M, Nakamura S, Fumimoto H, Takizawa J, Baba M: **Relation between smoking status of physicians and their enthusiasm to offer smoking cessation advice.** *Intern Med* 1997, **36**:162-165.
65. Grossman DW, Knox JJ, Nash C, Jimenez JG: **Smoking: Attitudes of Costa Rican physicians and opportunities for intervention.** *Bull World Health Organ* 1999, **77**:315-322.
66. Frank E: **The Women Physicians' Health Study: Background, objectives, and methods.** *J Am Med Womens Assoc* 1995, **50**:64-66.
67. Frank E, Lutz LJ: **Characteristics of women US family physicians.** *Arch Fam Med* 1999, **8**:313-318.
68. Frank E, Rothenberg R, Lewis C, Belodoff BF: **Correlates of physicians' prevention-related practices. Findings from the Women Physicians' Health Study.** *Arch Fam Med* 2000, **9**:359-367.
69. Tapia-Conyer R, Cravioto P, de la Rosa B, Galvan F, Garcia-de la Torre G, Kuri P: **Cigarette smoking; knowledge and attitudes among Mexican physicians.** *Salud Publica Mex* 1997, **39**:507-512.
70. Polyzos A, Gennatas C, Veslemes M, Daskalopoulou E, Stamatiadis D, Katsilambros N: **The smoking-cessation promotion practices of physician smokers in Greece.** *J Cancer Educ* 1995, **10**:78-81.
71. Heloma A, Reijula K, Tikkanen J, Nykyri E: **The attitudes of occupational health personnel to smoking at work.** *Am J Ind Med* 1998, **34**:73-78.
72. De Koninck M, Guay H, Bourbonnais R, Bergeron P: **Physical, mental, and reproductive health of Quebec women physicians.** *J Am Med Womens Assoc* 1995, **50**:59-63.
73. Bener A, Gomes J, Anderson JAD: **Smoking habits among physicians in two gulf countries.** *J R Soc Health* 1993, **113**:298-301.
74. Tessier JF, René L, Nejjari C, Belougne D, Moulin J, Freour P: **Attitudes and opinions of French general practitioners towards tobacco.** *Tob Control* 1993, **2**:226-230.
75. Hussain SF, Tjeder-Burton S, Campbell IA, Davies PD: **Attitudes to smoking and smoking habits among hospital staff.** *Thorax* 1993, **48**:174-175.
76. Yaacob I, Abdullah ZA: **Smoking habits and attitudes among doctors in a Malaysian hospital.** *Southeast Asian J Trop Med Public Health* 1993, **24**:28-31.
77. Doll R, Peto R, Wheatley K, Gray R, Sutherland I: **Mortality in relation to smoking: 40 years' observations on male British doctors.** *BMJ* 1994, **309**:901-911.
78. Kaetsu A, Fukushima T, Moriyama M, Shigematsu T: **Change of the smoking behavior and related lifestyle variables among physicians in Fukuoka, Japan: A longitudinal study.** *J Epidemiol* 2002, **12**:208-216.
79. Jormanainen VJ, Myllykangas MT, Nissinen A: **Decreasing the prevalence of smoking among Finnish physicians.** *Eur J Public Health* 1997, **7**:318-320.
80. Brink SG, Gottlieb NH, McLeroy KR, Wisotzky M, Burdine JN: **A community view of smoking cessation counselling in the practices of physicians and dentists.** *Public Health Rep* 1994, **109**:135-142.
81. Hensrud DD, Sprafka JM: **The smoking habits of Minnesota physicians.** *Am J Pub Health* 1993, **83**:415-417.
82. Waalkens HJ, Cohen Schotanus J, Adriaanse H, Knol K: **Smoking habits in medical students and physicians in Groningen, The Netherlands.** *Eur Respir J* 1992, **5**:49-52.
83. Kawane H: **Smoking among Japanese physicians.** *JAMA* 2001, **286**:917.
84. Kawane H: **The prevalence of smoking among physicians in Japan.** *Am J Public Health* 1993, **83**:1640.
85. Kawane H: **Smoking among older chest physicians.** *Chest* 1991, **99**:526.
86. Dekker HM, Looman CWN, Adriaanse HP, Van Der Maas PJ: **Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands.** *Soc Sci Med* 1993, **36**:817-822.
87. Hughes PH, Brandenburg N, Baldwin DC Jr, Storr CL, Williams KM, Anthony JC, *et al.*: **Prevalence of substance use among US physicians.** *JAMA* 1992, **267**:2333-2339.
88. Scott HD, Tierney JT, Buechner JS, Waters WJ Jr: **Smoking rates among Rhode Island physicians: Achieving a smoke-free society.** *Am J Prev Med* 1992, **8**:86-90.
89. Fowler G, Mant D, Fuller A, Jones L: **The "Help Your Patient Stop" initiative. Evaluation of smoking prevalence and dissemination of WHO/UICC guidelines in UK general practice.** *Lancet* 1989, **1**:1253-1255.
90. Saeed AA: **Attitudes and behaviour of physicians towards smoking in Riyadh city, Saudi Arabia.** *Trop Geogr Med* 1991, **43**:76-79.
91. Nutbeam D, Catford J: **Modifiable risks for cardiovascular disease among general practitioners in Wales.** *Public Health* 1990, **104**:353-361.
92. Hughes PH, Baldwin DC Jr, Sheehan DV, Conard S, Storr CL: **Resident physician substance use, by specialty.** *Am J Psychiatry* 1992, **149**:1348-1354.
93. Davies PD, Rajan K: **Attitudes to smoking and smoking habit among the staff of a hospital.** *Thorax* 1989, **44**:378-381.

94. Cheng KK, Lam TH: **Smoking among young doctors in Hong Kong: A message to medical educators.** *Med Educ* 1990, **24:**158-163.
95. Stillman FA, Becker DM, Swank RT, Hantula D, Moses H, Glantz S, *et al.*: **Ending smoking at the Johns Hopkins Medical Institutions. An evaluation of smoking prevalence and indoor air pollution.** *JAMA* 1990, **264:**1565-1569.
96. Sarkar D, Dhand R, Malhotra A, Malhotra S, Sharma BK: **Perceptions and attitude towards tobacco smoking among doctors in Chandigarh.** *Indian J Chest Dis Allied Sci* 1990, **32:**1-9.
97. Franceschi S, Serraino D, Talamini R, Candiani E: **Personal habits and attitudes towards smoking in a sample of physicians from the north-east of Italy.** *Int J Epidemiol* 1986, **15:**584-585.
98. Linn LS, Yager J, Cope D, Leake B: **Health habits and coping behaviors among practicing physicians.** *West J Med* 1986, **144:**484-489.
99. Joossens L, Demedts M, Prignot J, Bartsch P, Gyselen A: **Smoking habits of Belgian physicians: Effects of consonancy behaviour and of age.** *Acta Clin Belg* 1987, **42:**457-461.
100. Kaetsu A, Fukushima T, Moriyama M, Shigematsu T: **Smoking behavior and related lifestyle variables among physicians in Fukuoka, Japan: A cross sectional study.** *J Epidemiol* 2002, **12:**199-207.
101. Sachs DP: **Smoking habits of pulmonary physicians.** *N Engl J Med* 1983, **309:**799.
102. Sachs DP: **Treatment of cigarette dependency. What American pulmonary physicians do.** *Am Rev Respir Dis* 1984, **129:**1010-1013.
103. Seiler ER: **Smoking habits of doctors and their spouses in south east Scotland.** *J R Coll Gen Pract* 1983, **33:**598.
104. Senior SL: **Study of smoking habits in hospital and attitudes of medical staff towards smoking.** *CMAJ* 1982, **126:**131-133.
105. Fortmann SP, Sallis JF, Magnus PM, Farquhar JW: **Attitudes and practices of physicians regarding hypertension and smoking: The Stanford Five City Project.** *Prev Med* 1985, **14:**70-80.
106. Hay DR: **Intercensal trends in cigarette smoking by New Zealand doctors and nurses.** *NZ Med J* 1984, **97(754):**253-255.
107. Ballal SG: **Cigarette smoking and respiratory symptoms among Sudanese doctors.** *East Afr Med J* 1984, **61:**95-103.
108. Wyshak G, Lamb GA, Lawrence RS, Curran WJ: **A profile of the health-promoting behaviors of physicians and lawyers.** *N Engl J Med* 1980, **303:**104-107.
109. Wells KB, Lewis CE, Leake B, Ware JE Jr: **Do physicians preach what they practice? A study of physicians' health habits and counseling practices.** *JAMA* 1984, **252:**2846-2848.
110. Dodds AM, Rankin DW, Hill DJ, Gray NJ: **Attitudes and smoking habits of doctors in Victoria.** *Comm Health Stud* 1979, **3:**28-31.
111. Hay DR: **Cigarette smoking by New Zealand doctors: Results from the 1976 population census.** *NZ Med J* 1980, **91(658):**285-288.
112. Aaro LE, Bjartveit K, Vellar OD, Berglund EL: **Smoking habits among Norwegian doctors 1974.** *Scand J Soc Med* 1977, **5:**127-135.
113. Rankin DW, Gray NJ, Hill DJ, Evans DR: **Attitudes and smoking habits of Australian doctors.** *Med J Aust* 1975, **2:**822-824.
114. Christmas BW, Hay DR: **The smoking habits of New Zealand doctors: A review after ten years.** *NZ Med J* 1976, **83(565):**391-394.
115. Audet B: **When it comes to smoking, Japanese MDs do not set a good example for their patients.** *CMAJ* 1994, **150:**1673-1674.
116. Bartscherer DJ, Reichert VC, Folan P, Degaetano C, Jacobsen DR, Miceli L, *et al.*: **Tobacco and the health care industry.** *Clin Occup Environ Med* 2005, **5:**55-71.
117. Hay DR, Christmas BW: **The smoking habits of women doctors and doctors' wives in New Zealand.** *Prev Med* 1976, **5:**78-88.
118. Adriaanse H, van Reek J: **Physicians' smoking and its exemplary effect.** *Scand J Prim Health Care* 1989, **7:**193-196.
119. Anon: **Smoking and health: A physician's responsibility. A statement of the joint committee on smoking and health. American College of Chest Physicians, American Thoracic Society, Asia Pacific Society of Respirology, Canadian Thoracic Society, European Respiratory Society, International Union Against Tuberculosis and Lung Disease.** *Eur Respir J* 1995, **8:**1808-1811.
120. Chapman S: **Doctors who smoke.** *BMJ* 1995, **311:**142-143.
121. Centers for Disease Control and Prevention (CDC): **Smoking control among health-care workers – World No-Tobacco Day, 1993.** *MMWR Morb Mortal Wkly Rep* 1993, **42:**365-367.
122. Clever LH, Arsham GM: **Physicians' own health – some advice for the advisors.** *West J Med* 1984, **141:**846-854.
123. Fiore MC, Bailey WC, Cohen SJ, Dorfman SF, Goldstein MG, Gritz ER, *et al.*: **Treating Tobacco Use and Dependence.** *In Quick Reference Guide for Clinicians* Rockville, MD: U.S. Department of Health and Human Services. Public Health Service; 2000.
124. Raw M, McNeill A, West R: **Smoking cessation guidelines for health professionals. A guide to effective smoking cessation interventions for the health care system. Health Education Authority.** *Thorax* 1998, **53(Suppl 5, Pt 1):**1-19.
125. Zwar N, Richmond R, Borland R, Stillman S, Cunningham M, Litt J: **Smoking cessation guidelines for Australian general practice.** *Aust Fam Physician* 2005, **34:**461-466.
126. Rahman M, Fukui T: **Biomedical publication – global profile and trend.** *Public Health* 2003, **117:**274-280.
127. Smith DR, Leggat PA: **A comparison of tobacco smoking among dentists in 15 countries.** *Int Dent J* 2006, **56:**283-288.

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A comparison of tobacco smoking among dentists in 15 countries

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This study was conducted as a systematic review of all modern literature describing the prevalence and associations of tobacco smoking among dentists. A keyword search of appropriate MeSH terms was initially undertaken to identify relevant material. Reference lists of manuscripts were also examined to locate further publications. A total of 35 English-language studies published in the past 25 years met the inclusion criteria. Results suggest that the prevalence of smoking is generally quite low among dentists, and that it has also declined in many countries during recent years. The lowest rates were documented in the United States (USA), Thailand, Finland, Australia and Canada. When multiple studies were examined over time, it appears that dentists in Australia and the USA consistently report the lowest prevalence. Overall, this review suggests that dentists have one of the lowest smoking rates among all health professionals. There were a few exceptions however, namely Italy and Jordan, where dentists appear to be smoking at fairly high rates. Nevertheless, it is important that tobacco usage continues its decline in future years so that the dental profession may remain exemplars at the forefront of preventive oral care.

Key words: Dentist, smoking, tobacco, international, prevalence, review

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An international review of tobacco smoking research in the nursing profession, 1976–2006

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Abstract Tobacco smoking represents a contentious issue in the nursing profession, and one that has now become an important topic in nursing research. Despite this fact, the epidemiological quality of research varies widely, and it has been difficult to accurately determine the true incidence of smoking among nurses. Given these inconsistencies, we conducted a state-of-the-art review to identify international trends in tobacco usage among nurses, to ascertain how the epidemiological quality of research has improved over the past 30 years, and also to elucidate the directions in which nursing research has evolved. A total of 73 English-language studies that met the inclusion criteria were located and analysed. Overall, our review suggests that, while tobacco smoking among nurses appears to be decreasing in many countries during recent years, the international trend is far from uniform, and some developed nations still report high smoking rates among their nursing staff. From a methodological perspective, the relative epidemiological quality of smoking research has also fluctuated over time, making it difficult to compare the results of one study to the next. Despite these caveats, tobacco smoking remains a key topic in nursing research, as well as a critically important occupational-health issue for the entire nursing profession. In order to make the next generation of tobacco research data as comparable as possible, future scholars should consider devising and implementing a standardised format for conducting international tobacco smoking research within the nursing profession.

Key words tobacco, smoking, nurse, research, epidemiology, response rates

Introduction

The importance of smoking as a global threat to health cannot be underestimated. Tobacco is now the second leading cause of death worldwide, being responsible for at least five million fatalities each year. This figure is expected to rise to 10 million deaths per year in 2020, with about half of all smokers eventually being killed by their habit (World Health Organisation, 2006). Nurses are on the frontline in the war against tobacco, and many smoking patients will inevitably turn to them for smoking-related advice (Charlton et al., 1997). Tobacco control, therefore, represents a critical issue for the nursing profession in the twenty-first century (Sarna et al., 2005). As nurses are both public-health role models and the largest professional group in health care (Adriaanse et al., 1991), tobacco smoking among them has long been a contentious issue. In this regard it has been previously suggested that three main problems arise when a nurse smokes. First, there is the issue of the nurse's own health (Mundt et al., 1995). Second, there is the issue of passive exposure for those around them. And, thirdly, there is the broader issue of smoking patients who may not be as well-served by the smoking nurse (Bartscherer et al., 2006).

Aside from its adverse health effects, it is this third topic that represents a critical public health concern, as nurses are widely recognised as community role models for smoking and other lifestyle factors. Furthermore, the chance of a smoker successfully quitting can be increased markedly by nurse-led tobacco control interventions (Froelicher and Thompson, 2005). Nurses who smoke, on the other hand, represent a major barrier for successful tobacco-control interventions (Froelicher and Kohlman, 2005), and it has been shown that they may be less motivated to provide cessation support for patients (McKenna et al., 2001; Slater et al., 2006). While tobacco use has the potential to influence a nurse's status as role model and health educator (Padula, 1992), from an occupational health perspective, smoking also exerts a major impact on the nurse's work environment (Sarna et al., 2005). For these reasons and more, it is essential that the prevalence of smoking be continually reduced, if not eliminated, within the nursing profession.

While smoke-free nurses should clearly be leading their patients by example (Halcomb, 2005), the reason why nurses actually choose to smoke remains a complex and multifaceted conundrum. Three main themes often mentioned are stress, social influences and demographic background (Rowe and Clark, 2000a). Although stress has long been proposed as a primary reason for tobacco use in the nursing profession (Rausch et al., 1987; Elkind, 1988), causal relationships between the two have still not been clearly elucidated. In a study of Scottish nurses for example, Plant et al. (1992) found no significant differences in stress levels between smokers and non-smokers. Demographic correlations, on the other hand, are attractive, at least partly because many nursing students appear to commence smoking prior to entering the profession (Rowe and Clark, 2000a). Personal and occupational factors may also count for something, as there are well-known differences between substance usage rates and nursing speciality (Storr et al., 2000). Whatever the reason, it is imperative that nurses should not be smoking tobacco at all, and those who do so should be encouraged to quit. Helping nurses to quit smoking themselves is not a straightforward process, however (Chalmers et al., 2001); rather, it is one that can only be achieved when the complex reasons as to why nurses smoke are more clearly elucidated.

As a result of this ongoing conundrum, tobacco smoking has emerged as an increasingly important topic for nursing research (Sarna and Lillington, 2002), and

one which has, in turn, resulted in an increasingly large number of studies being published. Nevertheless, it has previously been noted that the quality of smoking research varies widely, and some inconsistent results have often been revealed (Rowe and Clark, 2000b). As such, it has been difficult to accurately determine the true incidence of smoking within the nursing profession. The aim of our current review, therefore, was to not only identify international trends in tobacco usage and smoking habits among nurses, but also to analyse the quality of research that has been undertaken in this regard. We were particularly interested in how the epidemiological quality of smoking research has progressed over the past 30 years from the perspective of sample sizes and response rates, and also the directions in which nursing research has evolved. Providing a clearer picture of how well smoking research has been undertaken in this regard might offer the additional benefit of promoting what Mulhall referred to as 'a more epidemiologically informed nursing profession' (2000: 65).

Method

Literature search strategy

We conducted a state-of-the-art review of all journal papers on tobacco smoking research that have been published in international journals over the past 30 years. As English has become the international language of scientific research and basically all literature search engines now include it, our review focused on manuscripts written in this particular format. The review began with a comprehensive literature search of the United States National Library of Medicine (Pubmed), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the British Nursing Index and the American Psychological Association (PsycINFO) databases, using relevant MeSH (Medical Subject Headings) terms such as: 'nurse', 'smoking' and 'tobacco'. After identifying some initial manuscripts, the search was repeated using keyword variations such as 'smoke' and 'nursing'. Although a surprisingly large number of smoking-related studies were found using these methods, it has been previously noted that only a fraction of nursing periodicals are currently included on medical research databases. Melby (2005), for example, estimates that less than 1 % of the nursing journals in existence today are actually listed in the Institute of Scientific Information (ISI) Journal Citation Reports. Any literature review that locates its material through search engines alone, therefore, could be expected to miss some important articles. Another methodological issue when conducting systematic reviews of previous research articles is the fact that biomedical research itself tends to have a general bias against countries with lower economic rankings (Rahman and Fukui, 2003). For these reasons, we considered it necessary to carefully check the reference lists of all manuscripts found using the initial search engines, in order to locate as many appropriate publications as possible.

Stratification of results

Each article located during the literature search was entered into a spreadsheet program for ease of searching and stratification. Studies were first arranged by the country in which the research had been conducted and then, in descending order, according to the year in which the research had been published. Smoking prevalence rates were listed as an overall smoking prevalence rate and prevalence rates by gender

Table 1 A summary of international tobacco smoking research conducted in the nursing profession, 1976–2006

Smoking rate[a]				Study details					Publication details	
Country	All	Male	Female	Category[b]	Method	Setting	*N*[c]	Response (%)	Authors	Year[d]
Australia	21	–	–	All	Internal mail	Multiple hospitals	1,457	80	Hughes and Rissel	1999
Australia	22	–	–	All	Interview	Multiple hospitals	335	88	Nagle et al.	1999
Australia	16	–	–	All	n/s	Single hospital	1,303	59	Jones et al.	1998
Australia	53	56	52	All	n/s	Multiple hospitals	220	n/s	Kirkby et al.	1976
Balkans	51	–	–	All	Hand delivered	Multiple hospitals	97	81	Hodgetts et al.	2004
Canada	12	–	–	All	Postal survey	Membership survey	1,269	65	Chalmers et al.	2000
Canada	17	–	–	All	Postal survey	Membership survey	1,714	85	O'Connor and Harrison	1992
Canada	17	–	–	All	Postal survey	Membership survey	4,776	85	Harrison	1991
Canada	–	–	23	All	Hand delivered	Multiple hospitals	822	90	Dore and Hoey	1988
Canada	32	–	–	All	n/s	Single hospital	508	n/s	Senior	1982
China	3	52	–	All	Hand delivered	Multiple hospitals	509	98	Smith et al.	2005
Denmark	18	–	–	All	Postal survey	Single hospital	729	75	Kannegaard et al.	2005
Denmark	28	–	–	All	Postal survey	Single hospital	445	91	Willaing et al.	2003
Finland	11	–	–	All	Postal survey	Membership survey	882	71	Pelkonen and Kankkunen	2001
Finland	15	–	–	OH	Postal survey	National survey	727	72	Heloma et al.	1998
France	34	–	–	All	n/s	Single hospital	895	83	Cooreman et al.	1989
Germany	29	–	–	All	Census data	National survey	3,981	n/s	John and Hanke	2003
Greece	46	–	–	All	n/s	Multiple hospitals	308	73	Beletsioti-Stika and Scriven	2006
Greece	–	–	46	RSP	n/s	Single hospital	114	n/s	Tselebis et al.	2001
Hong Kong	1	–	–	All	Hand delivered	Multiple hospitals	1,843	50	Johnston et al.	2005
Hong Kong	16	–	–	All	Postal survey	Membership survey	92	46	Callaghan et al.	1997
Israel	45	–	–	OBG	Postal survey	Multiple hospitals	290	83	Kaplan et al.	2002
Italy	44	–	–	All	Hand delivered	Single hospital	959	57	Nardini et al.	1998
Italy	41	40	42	All	Hand delivered	Multiple hospitals	1,313	68	Zanetti et al.	1998

Japan	11	19	11	All	Hand delivered	Single hospital	860	74	Smith et al.	2006
Japan	–	–	16	All	Hand delivered	Single hospital	432	96	Sekijima et al.	2005
Japan	–	–	12	All	Hand delivered	Single hospital	332	n/s	Ota et al.	2004
Japan	–	–	34	All	Hand delivered	Multiple hospitals	1,195	80	Kitajima et al.	2002
Japan	–	75	15	All	Hand delivered	Multiple hospitals	1,152	n/s	Ohida et al.	2000
Japan	–	–	19	All	Hand delivered	National survey	2,207	92	Ohida et al.	1999
New Zealand	18	27	18	All	Census data	National survey	30,507	n/s	Hay	1998
New Zealand	–	39	31	All	Census data	National survey	30,720	n/s	Hay	1984
New Zealand	–	49	36	All	Census data	National survey	27,323	n/s	Hay	1980
South Africa	31	–	–	All	Hand delivered	Single hospital	80	80	Retief et al.	2003
Taiwan	–	–	1	All	Postal survey	Multiple hospitals	907	98	Yang et al.	2001
United Kingdom	35	–	–	PSY	Internal mail	Single hospital	92	58	Bloor et al.	2006
United Kingdom	17	–	–	PSY	Postal survey	Single hospital	167	39	Dickens et al.	2004
United Kingdom	26	–	–	PSY	Postal survey	Single hospital	476	38	Stubbs et al.	2004
United Kingdom	26	–	–	All	Postal survey	Multiple hospitals	1,074	60	McKenna et al.	2003
United Kingdom	–	17	7	CD	Hand delivered	Conference survey	130	25	UNITE Study Group	2002
United Kingdom	21	–	–	All	Hand delivered	Single hospital	555	84	Rowe and Clark	1999
United Kingdom	7	–	–	GP	Postal survey	Multiple hospitals	58	100	Steptoe et al.	1999
United Kingdom	26	–	–	All	Hand delivered	Single hospital	418	92	Hope et al.	1998
United Kingdom	14	–	–	All	Postal survey	Journal readers	1,000	5	Alderman	1997
United Kingdom	20	–	–	All	Postal survey	Single hospital	1,069	82	Hussain et al.	1993
United Kingdom	26	–	–	TUT	Internal mail	Multiple hospitals	51	88	Blakey and Seaton	1992
United Kingdom	–	47	39	All	Interview	Multiple hospitals	600	89	Plant et al.	1991
United Kingdom	21	–	–	All	Hand delivered	Single hospital	663	70	Davies and Rajan	1989
United Kingdom	40	–	–	All	n/s	Multiple hospitals	1,577	56	Spencer	1984
United States	10	–	–	All	Internal mail	Multiple hospitals	58	n/s	Brown et al.	2006
United States	9	–	–	ANE	Postal survey	Membership survey	276	60	Yankie et al.	2006
United States	12	–	–	All	Postal survey	Health department	129	73	Kenna and Wood	2004

Table 1 continued

Smoking rate[a]				Study details					Publication details	
Country	All	Male	Female	Category[b]	Method	Setting	N[c]	Response (%)	Authors	Year[d]
United States	–	19	38	All	Postal survey	National survey	56,458	n/s	Bain et al.	2004
United States	10	–	–	All	Postal survey	Multiple hospitals	647	73	Braun et al.	2004
United States	4	–	–	SCH	Hand delivered	Conference survey	388	97	Petch-Levine et al.	2003
United States	–	–	16	All	Postal survey	National survey	381	74	Merchant et al.	2002
United States	13	–	–	HHC	Hand delivered	Membership survey	98	94	Borrelli et al.	2001
United States	7	–	–	ONC	Postal survey	National survey	1,508	38	Sama et al.	2000
United States	14	–	–	ED	Multiple methods	Single hospital	129	74	Barrett et al.	2000
United States	–	–	22	All	Postal survey	Membership survey	1,951	49	Collins et al.	1999
United States	14	–	–	All	Postal survey	National survey	4,438	78	Trinkoff and Storr	1998
United States	–	–	7	ONC	Postal survey	Membership survey	316	65	Reeve et al.	1996
United States	14	–	–	All	Postal survey	Membership survey	1,538	77	Mundt et al.	1995
United States	–	–	20	All	Postal survey	Membership survey	952	19	Blazer and Mansfield	1995
United States	18	–	–	All	Interview	National survey	901	n/s	Nelson et al.	1994
United States	16	–	–	All	n/s	Single hospital	1,008	39	Stillman et al.	1994
United States	22	–	–	All	Postal survey	Military nurses	307	98	Alexander and Beck	1990
United States	20	–	–	CC	Hand delivered	Workshop survey	499	70	Haughey et al.	1989
United States	22	–	–	All	Hand delivered	Single hospital	738	89	Brown and Kiss	1987
United States	–	–	34	All	Postal survey	National survey	91,651	n/s	Myers et al.	1987
United States	24	–	–	All	Postal survey	Membership survey	823	82	Feldman and Richard	1986
United States	22	–	–	All	Hand delivered	Single hospital	1,380	80	Becker et al.	1986
United States	26	–	–	All	Postal survey	Membership survey	545	52	Morra and Knobf	1983

[a]Smoking prevalence rates expressed in per cent and rounded to the nearest whole number, [b]Category of nurses who were surveyed (All = All types of nurses, OH = Occupational health nurses, RSP = Respiratory care nurses, OBG = Obstetrics and gynaecology nurses, PSY = Psychiatric nurses, CD = Cardiac care nurses, TUT = Nurse tutors, ANE = Nurse anaesthetists, SCH = School nurses, HHC = Home healthcare nurses, ONC = Oncology nurses, ED = Emergency department nurses, CC = Critical care nurses), [c]Number of nurses surveyed, [d]Publication year, n/s = not specified.

(where available), all of which were expressed in percentage values and rounded to the nearest whole number for standardisation purposes. The specialisation of nurses who were surveyed was stratified as follows: All = All types of nurses, OH = Occupational health nurses, RSP = Respiratory care nurses, OBG = Obstetrics and gynaecology nurses, PSY = Psychiatric nurses, CD = Cardiac care nurses, TUT = Nurse tutors, ANE = Nurse anaesthetists, SCH = School nurses, HHC = Home healthcare nurses, ONC = Oncology nurses, ED = Emergency department nurses and CC = Critical care nurses. The total number of nurses surveyed was included, as well as the response rate for each survey, again expressed as percentage values and rounded for standardisation purposes. Where the study only recruited nurses, the response rate clearly refers to this group. However, a certain proportion of investigations were actually conducted across a range of job descriptions, some of which listed specific response rates for each group, while others only gave a response rate for the entire group. As such, we used the nurse-only response rate wherever it was available, and where it was not, we listed the total number of nurses in the study and the overall response rate. The survey methodology of each study was stratified into categories depending on whether the authors had used a postal survey, hand-delivered surveys, a survey distributed by the internal mail system, census data or a personal interview. In one study, multiple survey methods had been used, and this was also indicated on the table. The location from where their nurses had been recruited was also stratified, depending on whether the nurses were working in single hospital, multiple hospitals, whether their names had been drawn from nurse association or state nurse registration lists, whether it was a national survey, they were conference attendees, military nurses, health department employees or nursing journal readers. For any category where the appropriate information was simply not listed, the term 'n/s' (not specified) was entered into the spreadsheet.

Statistical analysis

Basic statistical analysis was performed to help assess the progression of trends in tobacco-related nursing research over time. For these calculations, the year of publication was grouped into three groups, as follows: 1976–1985, 1986–1995 and 1996–2006. Average values were calculated for smoking prevalence rates, sample sizes and survey response rates, as we were particularly interested in how these values had evolved over time. From an epidemiological perspective, we also considered how well tobacco research has been conducted among nurses, what main results were being obtained and how has the research quality of research studies improved.

Results and discussion

Main findings

A total of 73 English-language studies that met the inclusion criteria were located and analysed during this study. As roughly two-thirds had been published in the past 10 years, it would appear that the available literature on nurse's tobacco smoking is rapidly increasing. One initial finding was the relatively large number of studies that have actually investigated tobacco smoking among nurses from a variety of countries. In this regard, we located research emanating from Australia, the Balkans, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, New Zealand, South Africa, Taiwan, the United Kingdom and the United States. As

expected, there was a tendency for most investigations to have been conducted in developed nations, which is consistent with the observations of Rahman and Fukui (2003) and one which represents an ongoing limitation of epidemiological research in this field. Roughly one-third of the manuscripts we located had originated from the United States, with a further one-fifth coming from the United Kingdom. Interestingly, a surprisingly large number of research projects had been conducted in Japan, representing almost 10% of the total. With the recent emergence of newly developing countries in the Asian and European regions, we were also pleased to find English-language studies that had been undertaken among nurses in the Balkans and China.

Study methodologies

The most common epidemiological tool for determining an individual's smoking status appears to be the self-reporting questionnaire. While biochemical measures of exhaled carbon monoxide (McClure, 2002) and serum or urinary cotinine (Bramer and Kallungal, 2003) as confirmatory biomarkers of smoking cessation are being increasingly used, the validity and accuracy of self-reported smoking surveys has been previously demonstrated in a variety of studies (Patrick et al., 1994; Vartiainen et al., 2002). Questionnaire surveys themselves represent a cost-effective, convenient, well-received and therefore useful methodology for researching large and dispersed professional groups, such as nurses. For these reasons, self-reporting questionnaire surveys were found to be the sole methodology for determining smoking prevalence rates among the studies we located. Despite this fact, one confounding factor noticed early on was a general lack of standardisation regarding the definition of tobacco 'smoker'. This issue may have arisen due to the inherent difficulties in assessing tobacco usage patterns over time, and the fact that most tobacco-related research simply described the point-prevalence of smoking within a certain group of nurses. Indeed, this appears to be a methodological issue across a number of studies we found, and one that could not be definitively resolved. While many authors referred to their subjects as being either 'smokers' or 'current smokers', some researchers used other labels such as 'regular smokers' or 'daily smokers'. In any case, the predominance of self-reporting smoking questionnaires suggests that these terms were of roughly equivalent meaning to the nurses they surveyed. As such, for the purposes of a comparative review across as wide a range of articles and countries as possible, we accepted that any of these four terms would have been equivalent in meaning.

Sample sizes

A major issue to consider from an epidemiological perspective is that of absolute sample size. In this regard, it is important to establish how many nurses have actually been participating in tobacco-related research during the past 30 years. The largest study conducted thus far that included smoking data appears to have been published by Myers and colleagues in 1987 (Myers et al., 1987). In their investigation, Myers et al. analysed the data of 91,651 married, female nurses from the United States, who had been recruited in the Nurses' Health Study. Follow-up data from the Nurses' Health Study were also used in the second largest investigation, published by Bain and colleagues in 2004 (Bain et al., 2004). In their article, Bain et al. (2004) was able to analyse the results of data from 56,458 nurses in the United States. The third

largest overall sample size that had been captured was published by Hay (1984). In this study, Hay extracted the data from 30,720 nurses during the New Zealand national census, one of the few countries in the world that actually includes smoking-related information as part of their census questions. Aside from research projects that used part of a larger national data set as their primary data source, there have also been smaller, but equally impressive, investigations undertaken during this time. At least three authors have published papers with nurse sample sizes over 2,000. The largest of these was described by Harrison in 1991, where 4,776 registered nurses in the Canadian Nurses Association were sampled. In 1998, Trinkoff and Storr published an article describing the substance-use patterns (including tobacco) among 4,438 registered nurses in the United States. In a three-phase study of German healthcare workers, John and Hanke (2003) recruited 3,981 nurses in the late 1990s.

While our review suggests that the absolute number of subjects that some researchers have been recruiting may be large, not all studies were equally impressive. Between 1976 and 2006, for example, at least eight researchers published studies where less than 100 nurses had been sampled. In 1992, for example, Blakey and Seaton published the results of their smoking survey among 649 student nurses and 51 nurse tutors. Steptoe and colleagues (1999) conducted a questionnaire survey of general practice in the United Kingdom, of whom 58 respondents were nurses. Brown et al. (2006) also published a survey of 58 Hawaiian nurses, which was part of a large investigation of job strain among nurses and teachers. From a statistical perspective, the distribution of absolute sample sizes was heavily skewed by the large national studies previously mentioned. While the mean sample size of nurse smoking surveys conducted in the past 30 years was around 4,000, this does not give a realistic indication of what sample sizes were generally being used by nurse researchers. As such, the median value (around 700) represents a more realistic estimation of the 'average' number of nurses being recruited. Half of all values lay between 300 and 1,300, suggesting that a large proportion of studies used sample sizes within this range.

Response rates

Although large sample sizes will no doubt create a favourable impression in the academic world, the practical value of any epidemiological investigation should be measured by how accurately its sample represents the overall population. From a statistical perspective, the response rate of studies included in our current review ranged from 5% to 100%, with a mean value of just over 70%. While the data was skewed towards 100% due to the 10 manuscripts with rates over 90%, the median value was around 75% with half of all values lying between 59% and 87%. As the issue of survey response is critical in all research activities, it important to recognise the wide range of response rates identified during the current review. The highest of these was published by Steptoe and colleagues in 1999 during their survey of 19 group practices in the United Kingdom. While a perfect response rate (100%) was stated, this may reflect the overall small number of nurses actually surveyed by the authors ($N = 58$). Nevertheless, at least three other investigations have also obtained very high response rates of 98% when targeting nurses in China (Smith et al., 2005), Taiwan (Yang et al., 2001) and the United States (Alexander and Beck, 1990). Similarly, Petch-Levine et al. (2003) captured 97% of their sample in the United States, while Sekijima et al. (2005) obtained a 96% response rate during a nurse survey in

Japan. Four additional authors also published studies where over 90% of their nurse sample was successfully sampled (Hope et al., 1998; Ohida et al., 1999; Borrelli et al., 2001; Willaing et al., 2003).

On the other hand, at least eight nurse smoking surveys published since 1976 had obtained responses from less than half the invited participants. That is, their response rates were all reported to be below 50% (Stillman et al., 1994; Blazer and Mansfield, 1995; Alderman, 1997; Callaghan et al., 1997; Sarna et al., 2000; UNITE Study Group, 2002; Dickens et al., 2004; Stubbs et al., 2004). The lowest response rate obtained during a nurse survey appears to have been published by Alderman in 1997. In this study, a national nursing journal from the United Kingdom inserted lifestyle-related questionnaires into 20,000 subscription copies of their journal. At the time of publication, 1,839 surveys had apparently been returned (9.2% response rate) and the data from 1,000 surveys analysed (5.0% of the total number originally sent out). From these crude figures, it can be suggested that the analysed data could have, at best, reflected only one-in-twenty nurses who were originally targeted. While the small response rate was acknowledged in an editorial (Gray, 1997), exactly how well their figures represent the overall nurse population or even the readership of the journal, remains unknown. Similarly, in 1995 Blazer and Mansfield published the results of a study that targeted nurses, clerical workers and blue-collar workers in the United States. From 5,000 nurses who were originally sent a substance-use questionnaire, only 952 replied (19.0%). As the authors then excluded 32 responses from male nurses, the final response rate could be calculated as being 18.5%. From these analyses, it can be seen that the response rate, not just the overall sample size, of a tobacco smoking survey is critically important for determining how representative the data actually is.

Low response rates are particularly important in surveys where the measured outcome may be socially undesirable, as participants may be reluctant or embarrassed to admit certain things on a survey, or even to return their survey at all. Nurses who smoke tobacco, for example, may feel guilty about their habit (Booth and Faulkner, 1986). As such, smoking among healthcare workers represents an area where responder bias can certainly occur, and one that was recognised as a methodological limitation of survey-based research early on. In 1970, for example, Burgess and Tierney surveyed smoking habits among American physicians and found that, although 90% of all non-smokers responded to their initial mailed survey, only 77% of smokers had done so. Later analysis of the smoking prevalence among survey respondents when compared to non-respondents also revealed wide discrepancies (with smoking rates of 22.6% among respondents versus 45.5% among non-respondents). In a postal survey of US nurses, Morra and Knobf (1983) revealed that the smoking rate among those who responded to their initial mailing (25.5%) was lower than among those who responded to a second follow-up mailing (30.4%). A more recent survey in Japan also found a similar trend. In their survey of Japanese physicians, Ohida et al. (2001) revealed that the prevalence of smoking among participants who responded to the second, third and fourth mailings was approximately 1.5 times higher than for those who had replied to the initial mailing (Ohida et al., 2001). These results tend to suggest that healthcare professionals who use tobacco may be reluctant to fill out and return smoking-related questionnaires. It is imperative, therefore, that nursing researchers carefully consider these issues when designing research investigations.

Smoking prevalence rates

From the publications located during our international review, a number of important issues can be established with regard to smoking prevalence rates. First, the overall prevalence of smoking has been shown to vary widely, both from country to country and from year to year. Some previous studies, for example, have shown that less than 5% of nurses are current smokers in Asian regions such as China (Smith et al., 2005), Hong Kong (Johnston et al., 2005) and Taiwan (Yang et al., 2001). This may reflect the overall high proportion of Asian nurses who are female (Arthur et al., 1999), combined with a general cultural reluctance for women to smoke in certain parts of the world (Mackay, 1996; Ernster et al., 2000). Even so, at least one study from the United States revealed that less than one-in-twenty nurses smoked tobacco (Petch-Levine et al., 2003). Similarly encouraging prevalence rates below 10% were also shown to exist among nurses in the United Kingdom (Steptoe et al., 1999) and the United States (Reeve et al., 1996; Sarna et al., 2000; Yankie et al., 2006). High contemporary smoking rates, on the other hand, have been revealed in Greece (Beletsioti-Stika and Scriven, 2006), Israel (Kaplan et al., 2002), Italy (Nardini et al., 1998; Zanetti et al., 1998) and South Africa (Retief et al., 2003).

Aside from their relative epidemiological value at the time, multiple studies conducted in the same country over time may give some insight as to how the smoking epidemic is progressing in that particular region. In this regard, tobacco consumption among Australian nurses apparently declined from 53% in 1976 (Kirkby et al., 1976) to 21% in 1999 (Hughes and Rissel, 1999), while in Canada the rate appeared to fall from 32% in 1982 (Senior, 1982) to 12% in the year 2000 (Chalmers et al., 2000). In the United States, where a variety of smoking surveys have been historically performed among nurses, early research suggested the smoking rate was around 26% in the early 1980s (Morra and Knobf, 1983), a rate that declined to 18% (Nelson et al., 1994) and then to 10% (Brown et al., 2006). Not all tobacco research conducted over time has revealed such clear trends in smoking reduction, however. In Japan, for example, the national smoking rate among female nurses was initially reported to be 19% in 1999 (Ohida et al., 1999). In 2002, however, Kitajima et al. (2002) found that 34% of their female nurses were smoking, whereas Smith et al. (2006) reported that the rate was only 11% among their group.

On the other side of the world in 1984, Spencer (1984) reported that 40% of their UK nurses were current tobacco smokers. This rate had apparently declined to 26% in 1992 (Blakey and Seaton, 1992) and 20% in 1993 (Hussain et al., 1993). Two UK publications from 2004, however (Dickens et al., 2004; Stubbs et al., 2004), reported smoking rates between 17% and 26%. A recent publication by Bloor et al. (2006), on the other hand, suggested a very high smoking rate of 35% among psychiatric nurses. From these results, it can be suggested that, while smoking rates among nurses may be declining in some regions over time, geographical differences may offer an important confounding factor if large numbers of nurses tend to smoke in certain regions. Furthermore, the different demographic background from which nurses in certain hospitals are being drawn may further complicate the issue of exactly how many nurses smoke in a particular country at a particular time. Multiple surveys conducted in a variety of regions will therefore be needed to more accurately answer these types of questions in the future. To date, the only countries that have looked at smoking rates among large, comprehensive, multidisciplinary and

nationally-representative samples of the nursing profession appear to be Japan (Ohida et al., 1999), New Zealand (Hay, 1980, 1984, 1998) and the United States (Myers et al., 1987; Bain et al., 2004). Further research of this nature should now be conducted in other countries.

Another major confounder noticed during the current review was the wide discrepancy in smoking prevalence rates between male and female nurses. While only a small proportion of manuscripts had divided their results by gender, in some cases where it had been done, these differences in prevalence rates were large. In one Chinese study, for example, the overall smoking rate was 3%, but among male nurses it was 52% (Smith et al., 2005), and in Japan 75% of male nurses reported smoking, whereas only 15% of females did (Ohida et al., 2000). Slightly higher smoking rates among male nurses were documented in Australia (56% versus 52%) (Kirkby et al., 1976), Japan (19% versus 11%) (Smith et al., 2006), New Zealand (27% versus 18%) (Hay, 1998) and the United Kingdom (17% versus 7%) (UNITE Study Group, 2002), (47% versus 39%) (Plant et al., 1991). At least two studies, on the other hand, found that more female nurses smoked when compared to their male counterparts. In one Italian study, for example, the smoking rate was shown to be 42% among female nurses and 40% among males (Zanetti et al., 1998), while in the United States, Bain et al. (2004) reported that 38% of female nurses smoked but only 19% of their male counterparts did. While the results of gender comparisons suggest that a nurse's smoking prevalence rate may vary in certain countries by gender, the direction and magnitude of these differences have not been shown to be uniform, and they are far from being clear-cut at the present time. Further nursing research will need to focus on exactly why male and female nurses choose to smoke, particularly whether there are any gender-specific reasons between the two groups.

Aside from gender differences, our review also revealed certain differences in tobacco-smoking rates between the nursing specialities. A large review on this particular topic conducted by Storr et al. (2000) suggested that smoking may be more common among nurses working in the fields of psychiatry, administration, emergency, medical, critical care and gerontology. The same authors also suggested that tobacco use is probably less common among midwives or nurses working in paediatrics. In an attempt to quantify these differences, Trinkoff and Storr (1998) investigated substance use among a multidisciplinary group of US nurses, finding that psychiatric nurses had not only the highest smoking prevalence rate of all specialities, but that they were also 2.4 times more likely to smoke tobacco than their counterparts. In our current review, only 16 studies had looked at smoking rates within an individual sub-speciality of the nursing profession. Of these 16, only psychiatric and oncology nurses had been the target of multiple studies. In the first instance, three separate surveys of tobacco use among staff in single psychiatric hospitals were conducted in the UK by Bloor et al. (2006), Dickens et al. (2004) and Stubbs et al. (2004). These authors found a smoking prevalence rate between 17% and 35%. It is worth noting that Bloor et al.'s (2006) 35% smoking prevalence was the highest rate documented among contemporary nurses in the United Kingdom. At least two authors have also investigated tobacco use among oncology nurses in the United States (Reeve et al., 1996; Sarna et al., 2000). Both documented a prevalence rate of 7%, which was one of the lowest contemporary rates seen in the American region. Although such results might suggest that psychiatric nurses tend to smoke more and

oncology nurses less, it is difficult to conclusively ascertain to what extent their samples are comparable. Given this conundrum, more national smoking research will need to be undertaken within the nursing profession that specifically investigate tobacco consumption habits by speciality.

From an epidemiological perspective, the prevalence of smoking among nurses also appears to have varied over time. While the average prevalence of smoking among nurses during our review was around 20%, this value appears to be on the decline. Among manuscripts published in the first 10 years for example (i.e. 1976–1985), the average smoking rate was around 38% overall, with approximately 48% of male nurses and 40% of female nurses being smokers at that time. By 1986–1995, the overall smoking rate had declined to 21%, and then to 20% between the years 1996–2006. This decline was slightly different for males (from 47% to 36%) than for females (25% to 21%), although the prevalence rate for both groups fell considerably. Average smoking rates by country could not be reliably calculated, simply due to the small number of studies conducted in each country (often only a single study), or the large lag between investigations undertaken in the same countries. Nevertheless, the overall prevalence of smoking among nurses appears to be on the decline as we enter the new millennium, contrary to an earlier review suggesting that many nurses smoked in the mid-to-late twentieth century (Adriaanse et al., 1991). Furthermore, a definite progression and, indeed, a major improvement of survey response rates were also evident over time. Studies conducted in the first 10 years of this review, for example, averaged only a 54% response rate, whereas the average response rate had risen to 70% among surveys conducted between 1996 and 2006. From our analyses it can be demonstrated that the overall smoking rate among nurses is steadily declining in recent years, while the response rate of surveys that investigate these issues has steadily increased. The quality of research on tobacco smoking within the nursing profession, therefore, clearly appears to be improving in recent years.

Conclusion

Overall, this review suggests that, while nurses' tobacco usage is decreasing in many countries during recent years, the international trend is far from uniform, and some developed nations still appear to have high smoking rates among their nursing staff. The prevalence and distribution of tobacco use has been shown to vary widely depending on the time period when the study was undertaken and also the nursing discipline that was sampled. Aside from tobacco-smoking rates, our review also suggests that the relative epidemiological quality of research investigations has fluctuated over time, making it difficult to directly compare the results from one individual study to another. Despite these caveats, tobacco smoking remains a key topic in nursing research as well as a critically important occupational health issue for the entire nursing profession. On the positive side, when considered from the perspective of sample sizes and response rates, the quality of nursing research in this field has been steadily improving in recent years. In order to make the next generation of tobacco research data as comparable as possible, however, future scholars should now consider devising and implementing a standardised format for conducting international tobacco-smoking research within the nursing profession.

Key points

- Although nurses' tobacco usage is probably decreasing in many countries during recent years, the international trend is far from uniform.
- The prevalence of nurses' smoking varies widely, depending on the time period the study was undertaken and the nursing discipline sampled.
- The relative epidemiological quality of smoking research has fluctuated over time, making it difficult to directly compare the results of one individual study to the next.
- Despite these caveats, tobacco smoking remains a key topic in nursing research, as well as a critically important occupational health issue for the entire nursing profession.
- Future scholars should now consider devising and implementing a standardised format for conducting international tobacco-smoking research within the nursing profession.

References

Adriaanse, H., Van Reek, J., Zandbelt, L., Evers, G. (1991) Nurses' smoking worldwide: a review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959–1988. *International Journal of Nursing Studies* **28**:4, 361–375.

Alderman, C. (1997) Here's looking at you. *Nursing Standard* **11**:16, 23–27.

Alexander, L.L., Beck, K. (1990) The smoking behaviour of military nurses: the relationship to job stress, job satisfaction and social support. *Journal of Advanced Nursing* **15**:7, 843–849.

Arthur, D., Pang, S., Wong, T., Alexander, M.F., Drury, J., Eastwood, H., Johansson, I., Jooste, K., Naude, M., Noh, C.H., O'Brien, A., Sohng, K.Y., Stevenson, G.R., Sy-Sinda, M.T., Thorne, S., van der Wal, D., Xiao, S. (1999) Caring attributes, professional self concept and technological influences in a sample of Registered Nurses in eleven countries. *International Journal of Nursing Studies* **36**:5, 387–396.

Bain, C., Feskanich, D., Speizer, F.E., Thun, M., Hertzmark, E., Rosner, B.A., Colditz, G.A. (2004) Lung cancer rates in men and women with comparable histories of smoking. *Journal of the National Cancer Institute* **96**:11, 826–834.

Barrett, T.W., Norton, V.C., Busam, M., Boyd, J., Maron, D.J., Slovis, C.M. (2000) Self-reported cardiac risk factors in emergency department nurses and paramedics. *Prehospital and Disaster Medicine* **15**:2, 14–17.

Bartscherer, D.J., Reichert, V.C., Folan, P., DeGaetano, C., Jacobsen, D.R., Miceli, L., Kohn, N., Talwar, A. (2006) Tobacco and the health care industry. *Clinics in Occupational and Environmental Medicine* **5**:1, 55–71.

Becker, D.M., Myers, A.H., Sacci, M., Weida, S., Swank, R., Levine, D.M., Pearson, T.A. (1986) Smoking behavior and attitudes toward smoking among hospital nurses. *American Journal of Public Health* **76**:12, 1449–1451.

Beletsioti-Stika, P., Scriven, A. (2006) Smoking among Greek nurses and their readiness to quit. *International Nursing Review* **53**:2, 150–156.

Blakey, R., Seaton, A. (1992) Smoking attitudes amongst nursing tutors and their students. *Health Bulletin (Edinburgh)* **50**:6, 417–421.

Blazer, L.K., Mansfield, P.K. (1995) A comparison of substance use rates among female nurses, clerical workers and blue-collar workers. *Journal of Advanced Nursing* **21**:2, 305–313.

Bloor, R.N., Meeson, L., Crome, I.B. (2006) The effects of a non-smoking policy on nursing staff smoking behaviour and attitudes in a psychiatric hospital. *Journal of Psychiatric and Mental Health Nursing* **13**:2, 188–196.

Booth, K., Faulkner, A. (1986) Links between nurses and cigarette smoking? *Nurse Education Today* **6**:4, 176–182.

Borrelli, B., Hecht, J.P., Papandonatos, G.D., Emmons, K.M., Tatewosian, L.R., Abrams, D.B. (2001) Smoking-cessation counseling in the home: attitudes, beliefs, and behaviors of home healthcare nurses. *American Journal of Preventive Medicine* **21**:4, 272–277.

Bramer, S.L, Kallungal, B.A. (2003) Clinical considerations in study designs that use cotinine as a biomarker. *Biomarkers* **8**:3–4, 187–203.

Braun, B.L., Fowles, J.B., Solberg, L.I., Kind, E.A., Lando, H., Pine, D. (2004) Smoking-related attitudes and clinical practices of medical personnel in Minnesota. *American Journal of Preventive Medicine* **27**:4, 316–322.

Brown, D.E., James, G.D., Mills, P.S. (2006) Occupational differences in job strain and physiological stress: female nurses and school teachers in Hawaii. *Psychosomatic Medicine* **68**:4, 524–530.

Brown, M.H., Kiss, M.E. (1987) Evaluation of competition as a method to recruit nurses into an employee self-help quit-smoking program: a failed experiment. *Cancer Nursing* **10**:4, 227–230.

Burgess, A.M., Tierney, J.T. (1970) Bias due to nonresponse in a survey of Rhode Island physicians' smoking habits – 1968. *New England Journal of Medicine* **282**:16, 908.

Callaghan, P., Fun, M.K., Yee, F.C. (1997) Hong Kong nurses' health-related behaviours: implications for

nurses' role in health promotion. *Journal of Advanced Nursing* **25**:6, 1276–1282.

Chalmers, K., Bramadat, I.J., Cantin, B., Shuttleworth, E., Scott-Findlay, S. (2000) Smoking characteristics of Manitoba nurses. *Canadian Nurse* **96**:1, 313–314.

Chalmers, K., Bramadat, I.J., Cantin, B., Murnaghan, D., Shuttleworth, E., Scott-Findlay, S., Tataryn, D. (2001) A smoking reduction and cessation program with registered nurses: findings and implications for community health nursing. *Journal of Community Health Nursing* **18**:2, 115–134.

Charlton, A., While, D., Mochizuki, Y. (1997) A survey into the smoking habits of nursing students. *Nursing Times* **93**:39, 58–60.

Collins, R.L., Gollnisch, G., Morsheimer, E.T. (1999) Substance use among a regional sample of female nurses. *Drug and Alcohol Dependence* **55**:1–2, 145–155.

Cooreman, J., Pretet, S., Levallois, M., Marsac, J., Perdrizet, S. (1989) Smoking among hospital nurses. *American Journal of Public Health* **79**:6, 782.

Davies, P.D., Rajan, K. (1989) Attitudes to smoking and smoking habit among the staff of a hospital. *Thorax* **44**:5, 378–381.

Dickens, G.L., Stubbs, J.H., Haw, C.M. (2004) Smoking and mental health nurses: a survey of clinical staff in a psychiatric hospital. *Journal of Psychiatric and Mental Health Nursing* **11**:4, 445–451.

Dore, K., Hoey, J. (1988) Smoking practices, knowledge and attitudes regarding smoking of university hospital nurses. *Canadian Journal of Public Health* **79**:3, 170–174.

Elkind, A.K. (1988) Do nurses smoke because of stress? *Journal of Advanced Nursing* **13**:6, 733–745.

Ernster, V., Kaufman, N., Nichter, M., Samet, J., Yoon, S.Y. (2000) Women and tobacco: moving from policy to action. *Bulletin of the World Health Organization* **78**:7, 891–901.

Feldman, B.M., Richard, E. (1986) Prevalence of nurse smokers and variables identified with successful and unsuccessful smoking cessation. *Research in Nursing and Health* **9**:2, 131–138.

Froelicher, E.S., Kohlman, V.C. (2005) Tobacco free nurses: the facts on nurses and smoking. *Journal of Cardiopulmonary Rehabilitation* **25**:4, 198–199.

Froelicher, E.S., Thompson, D.R. (2005) The facts on nurses and smoking. *European Journal of Cardiovascular Nursing* **4**:1, 1–2.

Gray, J. (1997) Number of nurses who smoke 'extremely low'. *Nursing Standard* **11**:16, 5.

Halcomb, K.A. (2005) Smoke-free nurses: leading by example. *American Association of Occupational Health Nurses Journal* **53**:5, 209–212.

Harrison, M.B. (1991) Assessment of the smoking prevention and cessation needs of Canadian student nurses & registered nurses. *Canadian Journal of Cardiovascular Nursing* **2**:1, 22.

Haughey, B.P., Mathewson, M.K., Dittmar, S.S., Wu, Y.W. (1989) Smoking practices of critical care nurses. *Heart and Lung* **18**:1, 29–35.

Hay, D.R. (1980) The smoking habits of nurses in New Zealand: results from the 1976 population census. *New Zealand Medical Journal* **92**:672, 391–393.

Hay, D.R. (1984) Intercensal trends in cigarette smoking by New Zealand doctors and nurses. *New Zealand Medical Journal* **97**:574, 253–255.

Hay, D.R. (1998) Cigarette smoking by New Zealand doctors and nurses: results from the 1996 population census. *New Zealand Medical Journal* **111**:1062, 102–104.

Heloma, A., Reijula, K., Tikkanen, J., Nykyri, E. (1998) The attitudes of occupational health personnel to smoking at work. *American Journal of Industrial Medicine* **34**:1, 73–78.

Hodgetts, G., Broers, T., Godwin, M. (2004) Smoking behaviour, knowledge and attitudes among family medicine physicians and nurses in Bosnia and Herzegovina. *BMC Family Practice* June **11**:5, 12.

Hope, A. Kelleher, C.C., O'Connor, M. (1998) Lifestyle practices and the health promoting environment of hospital nurses. *Journal of Advanced Nursing* **28**:2, 438–447.

Hughes, A.M., Rissel, C. (1999) Smoking: rates and attitudes among nursing staff in central Sydney. *International Journal of Nursing Practice* **5**:3, 147–154.

Hussain, S.F., Tjeder-Burton, S., Campbell, I.A., Davies, P.D.O. (1993) Attitudes to smoking and smoking habits among hospital staff. *Thorax* **48**:2, 174–175.

John, U., Hanke, M. (2003) Tobacco-smoking prevalence among physicians and nurses in countries with different tobacco-control activities. *European Journal of Cancer Prevention* **12**:3, 235–237.

Johnston, J.M., Chan, S.S., Chan, S.K., Lam, T.H., Chi, I., Leung, G.M. (2005) Training nurses and social workers in smoking cessation counseling: a population needs assessment in Hong Kong. *Preventive Medicine* **40**:4, 389–406.

Jones, T.E., Crocker, H., Ruffin, R.E. (1998) Smoking habits and cessation programme in an Australian teaching hospital. *Australian and New Zealand Journal of Medicine* **28**:4, 446–452.

Kannegaard, P.N., Kreiner, S., Gregersen, P., Goldstein, H. (2005) Smoking habits and attitudes to smoking 2001 among hospital staff at a Danish hospital – comparison with a similar study 1999. *Preventive Medicine* **41**:1, 321–327.

Kaplan, B., Yogev, Y., Fisher, M., Gall, B., Dekel, A., Sulkes, J., Rabinerson, D. (2002) Self-health attitudes and practices of obstetrics and gynecology nurses in Israel. *Clinical and Experimental Obstetrics and Gynecology* **29**:2, 115–116.

Kenna, G.A., Wood, M.D. (2005) The prevalence of alcohol, cigarette and illicit drug use and problems among dentists. *Journal of the American Dental Association* **136**:7, 1023–1032.

Kinn, S., Curzio, J. (2005) Integrating qualitative and quantitative research methods. *Journal of Research in Nursing* **10**:3, 317–336.

Kirkby, R.J., Bashkawi, E.B., Drew, C.A., Foenander, G.P. (1976) Smoking in nurses. *Medical Journal of Australia* **2**:23, 864–865.

Kitajima, T., Ohida, T., Harano, S., Kamal, A.M., Takemura, S., Nozaki, N., Kawahara, K., Minaowa, M. (2002) Smoking behavior, initiating and cessation factors among Japanese nurses: a cohort study. *Public Health* **116**:6, 347–352.

McClure, J.B. (2002) Are biomarkers useful treatment aids for promoting health behaviour change? An empirical review. *American Journal of Preventive Medicine* **22**:3, 200–207.

Mackay, J. (1996) Women and tobacco: international issues. *Journal of the American Medical Women's Association* **51**:1–2, 48–51.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A., McElwee, G. (2001) Qualified nurses' smoking prevalence: their reasons for smoking and desire to quit. *Journal of Advanced Nursing* **35**:5, 769–775.

McKenna, H., Slater, P., McCance, T., Bunting, B., Spiers, A., McElwee, G. (2003) The role of stress, peer influence and education levels on the smoking behaviour of nurses. *International Journal of Nursing Studies* **40**:4, 359–366.

Melby, C.S. (2005) Examining the future of professional journals. *Nursing and Health Sciences* **7**:4, 219–220.

Merchant, A., Pitiphat, W., Douglass, C.W., Crohin, C., Joshipura, K. (2002) Oral hygiene practices and periodontitis in health care professionals. *Journal of Periodontology* **73**:5, 531–535.

Morra, M.E., Knobf, M.K. (1983) Comparison of nurses' smoking habits: the 1975 DHEW survey and Connecticut nurses, 1981. *Public Health Reports* **98**:6, 553–557.

Mulhall, A. (2000) The case for a more epidemiologically informed nursing profession. *Journal of Research in Nursing* **5**:1, 65–73.

Mundt, M.H., Glass, L.K., Michaels, C. (1995) A professional challenge: nurses and smoking. *Journal of Community Health Nursing* **12**:3, 139–146.

Myers, A.H., Rosner, B., Abbey, H., Willet, W., Stampfer, M.J., Bain, C., Lipnick, R., Hennekens, C., Speizer, F. (1987) Smoking behavior among participants in the nurses' health study. *American Journal of Public Health* **77**:5, 628–630.

Nagle, A., Schofield, M., Redman, S. (1999) Australian nurses' smoking behaviour, knowledge and attitude towards providing smoking cessation care to their patients. *Health Promotion International* **14**:2, 133–144.

Nardini, S., Bertoletti, R., Rastelli, V., Ravelli, L., Donner, C.F. (1998) Personal smoking habit and attitude toward smoking among the health staff of a general hospital. *Monaldi Archives of Chest Diseases* **53**:1, 74–78.

Nelson, D.E., Giovino, G.A., Emont, S.L., Brackbill, R., Cameron, L.L., Peddicord, J., Mowery, P.D. (1994) Trends in cigarette smoking among US physicians and nurses. *Journal of the American Medical Association* **271**:16, 1273–1275.

O'Connor, A.M., Harrison, M. (1992) Survey of smoking prevalence among Canadian nursing students and registered nurses. *Canadian Journal of Public Health* **83**:6, 417–421.

Ohida, T., Osaki, Y., Kobayashi, Y., Sekiyama, M., Minowa, M. (1999) Smoking prevalence of female nurses in the national hospitals of Japan. *Tobacco Control* **8**:2, 192–195.

Ohida, T., Kawahara, K., Osaki, Y., Sone, T., Kamal, A.M., Kawaguchi, T., Sekiyama, M., Harita, A., Minowa, M. (2000) Behaviors and attitudes towards smoking among the nurses in Japan. *Journal of Epidemiology* **10**:5, 344–348.

Ohida, T., Takemura, S., Nozaki, N., Kawahara, K., Minowa, M., Mochizuki, Y. (2001) The validity of repeated mail surveys concerning smoking habits for Japanese physicians. *Japanese Journal of Public Health* **48**:8, 573–583 (in Japanese).

Ota, A., Yasuda, N., Okamoto, Y., Kobayashi, Y., Sugihara, Y., Koda, S., Kawakami, N., Ohara, H. (2004) Relationship of job stress with nicotine dependence of smokers: a cross-sectional study of female nurses in a general hospital. *Journal of Occupational Health* **46**:3, 220–224.

Padula, C.A. (1992) Nurses and smoking: review and implications. *Journal of Professional Nursing* **8**:2, 120–132.

Patrick, D.L., Cheadle, A., Thompson, D.C., Diehr, P., Koepsell, T., Kinne, S. (1994) The validity of self-reported smoking: a review and meta-analysis. *American Journal of Public Health* **84**:7, 1086–1093.

Pelkonen, M., Kankkunen, P. (2001) Nurses' competence in advising and supporting clients to cease smoking: a survey among Finnish nurses. *Journal of Clinical Nursing* **10**:4, 437–441.

Petch-Levine, D., Young Cureton, V., Canham, D., Murray, M. (2003) Health practices of school nurses. *Journal of School Nursing* **19**:5, 273–280.

Plant, M.L., Plant, M.A., Foster, J. (1991) Alcohol, tobacco and illicit drug use amongst nurses: a Scottish study. *Drug and Alcohol Dependence* **28**:2, 195–202.

Plant, M.L., Plant, M.A., Foster, J. (1992) Stress, alcohol, tobacco and illicit drug use amongst nurses: a Scottish study. *Journal of Advanced Nursing* **17**:9, 1057–1067.

Rahman, M., Fukui, T. (2003) Biomedical publication: global profile and trend. *Public Health* **117**:4, 274–280.

Rausch, J.C., Hopp, J., White, R. (1987) Determinants of smoking behavior among nurses. *Journal of Drug Education* **17**:4, 365–377.

Reeve, K., Adams, J., Kouzekanani, K. (1996) The nurse as exemplar: smoking status as a predictor of attitude toward smoking and smoking cessation. *Cancer Practice* **4**:1, 31–33.

Retief, F.W., Prinsloo, E., Calitz, J., Barnes, J.M. (2003) Smoking among nursing staff at Tygerberg Hospital, Cape Town. *South African Medical Journal* **93**:9, 661–663.

Rowe, K., Clark, J.M. (1999) Evaluating the effectiveness of a smoking cessation intervention designed for nurses. *International Journal of Nursing Studies* **36**:4, 301–311.

Rowe, K., Clark, J.M. (2000a) Why nurses smoke: a review of the literature. *International Journal of Nursing Studies* **37**:2 173–181.

Rowe, K., Clark, J.M. (2000b) The incidence of smoking amongst nurses: a review of the literature. *Journal of Advanced Nursing* **31**:5, 1046–1053.

Sarna, L., Lillington, L. (2002) Tobacco: an emerging topic in nursing research. *Nursing Research* **51**:4, 245–253.

Sarna, L., Bialous, S.A., Wewers, M.E., Froelicher, E.S., Danao, L. (2005) Nurses, smoking, and the workplace. *Research in Nursing and Health* **28**:1, 79–90.

Sarna, L.P., Brown, J.K., Lillington, L., Rose, M., Wewers, M.E., Brecht, M.L. (2000) Tobacco interventions by oncology nurses in clinical practice: report from a national survey. *Cancer* **89**:4, 881–889.

Sekijima, K., Seki, N., Suzuki, H. (2005) Smoking prevalence and attitudes toward tobacco among student and staff nurses in Niigata, Japan. *Tohoku Journal of Experimental Medicine* **206**:3 187–194.

Senior, S.L. (1982) Study of smoking habits in hospital and attitudes of medical staff towards smoking. *Canadian Medical Association Journal* **126**:2, 131–133.

Slater, P., McElwee, G., Fleming, P., McKenna, H. (2006) Nurses' smoking behaviour related to cessation practice. *Nursing Times* **102**:19, 32–37.

Smith, D.R., Wei, N., Wang, R.S. (2005) Contemporary smoking habits among nurses in Mainland China. *Contemporary Nurse* **20**:2, 258–266.

Smith, D.R., Adachi, Y., Mihashi, M., Ueno, C., Ishitake, T. (2006) Tobacco smoking habits among a cross-section of rural Japanese nurses. *Australian Journal of Advanced Nursing* 24 (in press).

Spencer, J.K. (1984) Nurses' cigarette smoking in England and Wales. *International Journal of Nursing Studies* 21:2, 69–79.

Steptoe, A., Doherty, S., Kendrick, T., Rink, E., Hilton, S. (1999) Attitudes to cardiovascular health promotion among GPs and practice nurses. *Family Practice* 16:2, 158–163.

Stillman, F.A., Hantula, D.A., Swank, R. (1994) Creating a smoke-free hospital: attitudes and smoking behaviors of nurses and physicians. *American Journal of Health Promotion* 9:2, 108–114.

Storr, C.L., Trinkoff, A.M., Hughes, P. (2000) Similarities of substance use between medical and nursing specialties. *Substance Use and Misuse* 35:10, 1443–1469.

Stubbs, J., Haw, C., Garner, L. (2004) Survey of staff attitudes to smoking in a large psychiatric hospital. *Psychiatric Bulletin* 28:6, 204–207.

Trinkoff, A.M., Storr, C.L. (1998) Substance use among nurses: differences between specialties. *American Journal of Public Health* 88:4, 581–585.

Tselebis, A., Panaghiotou, A., Theotoka, I., Ilias, I. (2001) Nursing staff anxiety versus smoking habits. *International Journal of Nursing Practice* 7:3, 221–223.

Undertaking Nursing Interventions Throughout Europe (UNITE) Study Group (2002) A survey of coronary risk factors in a cohort of cardiac nurses from Europe: do nurses practise what they preach? *European Journal of Cardiovascular Nursing* 1:1, 57–60.

Vartiainen, E., Seppala, T., Lillsunde, P., Puska, P. (2002) Validation of self reported smoking by serum cotinine measurement in a community-based study. *Journal of Epidemiology and Community Health* 56:3, 167–170.

Willaing, I., Jørgensen, T., Iversen, L. (2003) How does individual smoking behaviour among hospital staff influence their knowledge of the health consequences of smoking? *Scandinavian Journal of Public Health* 31:2, 149–155.

World Health Organisation Website (WHO) (2006) *Tobacco Free Initiative: Why is Tobacco a Public Health Priority?* Available from: http://www.who.int/tobacco/health_priority/en/index.html (21 September 2006).

Yang, M.S., Yang, M.J., Pan, S.M. (2001) Prevalence and correlates of substance use among clinical nurses in Kaohsiung city. *Kaohsiung Journal of Medical Sciences* 17:5, 261–269.

Yankie, V.M., Price, H.M., Nanfito, E.R., Jasinski, D.M., Crowell, N.A., Heath, J. (2006) Providing smoking cessation counseling: a national survey among nurse anesthetists. *Critical Care Nursing Clinics of North America* 18:1, 123–129.

Zanetti, F., Gambi, A., Bergamaschi, A., Gentilini, F., De Luca, G., Monti, C., Stampi, S. (1998) Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. *Public Health* 112:1, 57–62.

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An international review of tobacco smoking among medical students

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ABSTRACT

We conducted a systematic international review of tobacco smoking habits among medical students. Particular attention was paid to countries where smoking rates have been historically well-documented in local journals, but were less often included in larger international review articles. The methodology involved a search of relevant medical subject headings, after which the reference lists of journal papers were also examined to find additional publications. A total of 66 manuscripts met the inclusion criteria. The most common countries previously studied included India, the United States, Australia, Japan, Pakistan, Turkey and the United Kingdom. Overall, our review suggests that the prevalence of smoking among medical students varies widely amongst different countries and also between male and female students within the same areas. Consistently low smoking rates were found in Australia and the United States, while generally high rates were reported in Spain and Turkey. Given their important future role as exemplars, more effective measures to help reduce tobacco smoking among medical students are clearly needed worldwide.

KEY WORDS: Medical education, medical student, prevalence, smoking, tobacco

Health professionals have an important role to play in the fight against tobacco. As individuals they can help educate the population, as community members they can support anti-smoking policies and at a societal level, they can influence national and global tobacco control efforts.[1] Physicians occupy a key position in this regard, as they are uniquely placed to lead smoking cessation programs in the community.[2] Patients expect information, help and guidance from their primary care physician on a number of health-related matters.[3] Physicians also play an important role in helping patients to stop smoking.[4] As future physicians who will witness the continued burden of smoking-related diseases among their patients, medical students represent a primary target for tobacco-prevention programs. The potential success of these strategies may be suboptimal however, if the true dangers of smoking are not adequately recognized. As medical students progress through medical school for example, their knowledge of smoking-related diseases naturally increases.[5] Nevertheless, substance use remains fairly common in this group[6] and a superior knowledge of smoking-related risks does not always correlate with a lower rate of smoking among senior medical students.[5] As such, many researchers have historically investigated tobacco smoking rates among this demographic group.

The first step in understanding the problem was to find out what proportion actually smoked. In this regard, in 1966, Mausner[7] noted that around one-third of their American medical students were using tobacco products. Research from Australia in the early 1970s also suggested a similar prevalence rate.[8] In 1985, the tobacco and health committee of the international union against tuberculosis and lung disease began a large investigation on smoking habits among medical students in a variety of countries. The first publications focused on medical students in 14 European countries,[9] followed by research among 10 African and Middle Eastern countries[10] and nine Asian countries.[11] In 1993, Tessier *et al.*[12] published another large study of smoking behavior among medical students in Australia, Japan, the United States, Russia and Estonia. Smoking rates among students were shown to vary widely from country to country.[13] In 2005, the World Health Organization (WHO), the US Centers for Disease Control and prevention and the Canadian Public Health Association developed what was termed the Global Health Professionals Survey to investigate tobacco smoking habits among medical, dental, nursing and pharmacy students in a variety of WHO member states. Results from their pilot study were published in 2005.[14]

While a large number of researchers have now investigated

the issue of tobacco smoking among medical students, few systematic international reviews appear to have been conducted on this topic. The purpose of the current paper therefore, was to undertake a systematic international review on the prevalence of tobacco usage among medical students. We also paid particular attention to countries where smoking rates among medical students have been well-documented in local studies and domestic journals, but where the results were less often included in larger international reviews on the topic. A further aim of this review was to investigate the epidemiological quality of smoking research articles which have targeted medical students.

Methods

Our current study began with an extensive literature review targeting manuscripts published in peer-reviewed journals relating to the topic of tobacco smoking among medical students. The review began with a search of relevant medical subject headings such as 'smoking', 'tobacco' and 'medical student' on PubMed, the National Library of Medicine in the United States.[15] After identifying some initial journal papers, the search was repeated using keyword variations such as 'smoke', 'medical education' and 'substance use'. To be sure that we did not miss any manuscripts from the underrepresented countries previously mentioned, further country-specific keywords such as 'India', 'Pakistan', 'Malaysia', 'Thailand' and so on, were also added to the search. Due to the wide variety of languages used for publishing scientific articles on PubMed, our review was limited to manuscripts written in English. As research becomes dated quickly, only articles published in the past 30 years (that is, between 1976 and 2006 were included in the current review. The reference lists of all journal papers located using these initial criteria were subsequently examined to find additional publications.

Manuscripts were sorted by country of origin and then arranged in descending order on a single table, according to the year in which the study was published. All papers were assigned an ascending reference number based on the abovementioned criteria. For consistency, all smoking prevalence rates were rounded to the nearest whole number and listed as prevalence rates by gender and as total group prevalence rates, wherever possible. The study design for each manuscript was assigned into the following four epidemiological categories: Single grade (where only one grade of students was sampled), multiple grade (where multiple grades of students were sampled), cross-sectional (where a complete cross-section of students from the medical school had been sampled) and longitudinal (where at least one grade of students was sampled at more than one point in time). Where a single grade of medical students was sampled in multiple locations, the number of grades actually sampled was listed after the grade. Year of study in the medical course which the sampled students were attending, was also listed. Response rates for each study were examined and then rounded to the nearest whole number for standardization purposes. Where authors had used a convenience sample with an unspecified response rate or where the response rate could not be determined from the manuscript, a note on this missing information was also indicated on the table.

Discussion

A total of 66 manuscripts met the inclusion criteria for this review[16-81] as indicated in Table 1. The most common countries in which they had been conducted included India, the United States, Australia, Japan, Pakistan, Turkey and the United Kingdom. The majority had been undertaken as questionnaire surveys among a complete cross-section of students within a single medical school. The next most common methodology involved surveying a single grade of medical students, usually comprising those in either the first grade or fifth grade at university. The number of participants in each study ranged from 41[62] to 5744[76] with a median of 407 students. Particularly large surveys of medical students' tobacco smoking habits (where over 2000 participants were sampled) appear to have been conducted in the United States,[76] Turkey,[68] Spain[63] and Colombia.[27] Overall survey response rates ranged from 40%[63] to 100%[43,48-50,52,53,59,62,71] with a median response rate of 90%. Few manuscripts had response rates below 50%[63,75,80] while the participation rate in seven other studies was not specified. While these demographic findings were encouraging, some confounding factors were also evident among some articles located during our review.

One particularly important confounder was a lack of standardization regarding the definition of 'smoker'. Although most researchers classified their subjects dichotomously, as being either smokers or nonsmokers, some other recall periods were occasionally used, such as daily smoker, occasional smoker and so on. This shortfall is not only limited to tobacco smoking surveys of medical students however, having been previously noted as a methodological issue in other review articles conducted among different populations.[82] The problem possibly arises when studying medical students due to the inherent difficulties in determining tobacco usage habits over time and the fact that most investigations investigate the point-prevalence of smoking among the surveyed group. Medical students, as indeed all university students, represent a widely dispersed population who are often away from campus while undertaking practical training. This methodological limitation suggests that surveys conducted among single grades of students during lecture periods, have probably been the most practical manner for investigating smoking. Whatever the cause of these methodological shortfalls, the issue of what exactly comprises a 'currently smoking' medical student clearly represents an area on which some international agreement should be reached, in order to allow greater comparability between future investigations. Furthermore, from an epidemiological perspective, some fundamental issues should also be considered. For smoking surveys to report any meaningful data on the population as a whole, it is important that a large proportion of the total group is captured and that a large proportion of those who are contacted, actually respond. In our current review, despite the existence of the aforementioned confounding factors, we were encouraged to find that a large proportion of all manuscripts had reasonably

Table 1: International comparison of tobacco smoking surveys conducted among medical students between 1976 and 2006

Smoking rate[a]				Details of study[b]				Publication details[c]		
Country	All	Male	Female	Grades	Design	N	Response	Authors	Year	Reference
Albania	14	34	5	1st Year	Single grade	149	82	Vakeflliu *et al.*	2002	16
Australia	3	-	-	1st and 5th Yrs	Multiple grades	594	79	Richmond and Kehoe	1997	17
Australia	5	-	-	5th Year x 3	Longitudinal	379	69	Roche	1997	18
Australia	4	-	-	5th Year	Single grade	173	79	Roche *et al.*	1996	19
Australia	4	-	-	5th Year	Single grade	250	79	Roche and Beauchamp	1994	20
Australia	6	-	-	1st and 4th Yrs	Multiple grades	431	n/s	Engs	1980	21
Brazil	3	-	-	n/s	Cross-sectional	513	73	Daudt *et al.*	1999	22
Brazil	14	10	18	n/s	Single grade	103	96	Paine *et al.*	1985	23
China	6	13	0	4th Year	Single grade	207	92	Smith *et al.*	2005	24
China	-	38	0	All (Yrs 1-5)	Cross-sectional	1540	96	Xiang *et al.*	1999	25
China	3	6	1	All (Yrs 1-5)	Cross-sectional	1392	86	Lei *et al.*	1997	26
Colombia	26	28	24	1st and 5th Yrs	Multiple grades	2021	90	Rosselli *et al.*	2001	27
Croatia	29	-	-	All (Yrs 1-6)	Cross-sectional	775	98	Trkulja *et al.*	2003	28
Germany	24	29	18	1st,3rd,5th Yrs	Multiple grades	696	85	Brenner and Scharrer	1996	29
Greece	41	41	40	n/s	Cross-sectional	1072	n/s	Sichletidis *et al.*	2006	30
Greece	-	33	28	(3rd Year) x 12	Longitudinal	849	98	Mammas *et al.*	2003	31
Holland	18	19	16	n/s	Cross-sectional	160	80	Dekker *et al.*	1993	32
Holland	27	31	23	n/s	Cross-sectional	725	95	Waalkens *et al.*	1992	33
Hungary	36	-	-	4th Year	Single grade	91	90	Piko	2002	34
Hungary	21	-	-	n/s	Multiple grades	177	73	Piko *et al.*	1996	35
India	-	8	-	All (Yrs 1-5)	Cross-sectional	1130	75	Mohan *et al.*	2006	36
India	4	5	0	All (Yrs 1-5)	Cross-sectional	1189	74	Ramakrishna *et al.*	2005	37
India	-	23	-	All (Yrs 1-5)	Cross-sectional	400	93	Sinha and Gupta	2001	38
India	-	19	-	(n/s) x 10	Longitudinal	196	64	Venkataraman *et al.*	1996	39
India	31	35	5	All (Yrs 1-5)	Cross-sectional	854	66	Singh *et al.*	1989	40
India	7	-	-	1st Year x 5	Longitudinal	355	70-82	Behera and Malik	1987	41
India	27	-	-	All (Yrs 1-5)	Cross-sectional	1600	80	Sandell *et al.*	1983	42
India	-	3	0	1st Year x 7	Single grade	705	100	Roy and Chakraborty	1981	43
India	11	-	-	n/s	Cross-sectional	672	90	Singh *et al.*	1981	44
Iran	13	-	-	All (Yrs 1-4)	Cross-sectional	421	25	Ahmadi *et al.*	2001	45
Ireland	10	10	8	All (Yrs 1-6)	Longitudinal	537	94	Boland *et al.*	2006	46
Japan	-	16-28	2-4	4th and 5th Yrs	Longitudinal	1366	n/s	Ozasa *et al.*	2005	47
Japan	17	-	-	5th Year	Single grade	100	100	Kusunoki *et al.*	1999	48
Japan	-	58	-	5th Year	Single grade	77	100	Kawane	1992	49
Japan	-	51	8	5th Year	Single grade	129	100	Kawane	1987	50
Malaysia	9	-	0	1st Year	Longitudinal	148	95	Frisch *et al.*	1999	51
Malaysia	9	22	0	All (Yrs 1-4)	Cross-sectional	395	100	Yaacob and Abdullah	1994	52
Malaysia	10	17	1	3rd and 4th Yrs	Multiple grades	271	100	Wong and Chen	1989	53
Pakistan	14	22	4	All (Yrs 1-5)	Cross-sectional	271	90	Khan *et al.*	2005	54
Pakistan	-	26	2	n/s	Multiple grades	264	92	Omair *et al.*	2002	55
Pakistan	11	17	4	n/s	Multiple grades	289	89	Hussain *et al.*	1995	56
Pakistan	-	21	1	All (Yrs 1-6)	Cross-sectional	1363	62	Ahmed and Jafarey	1983	57
Saudi Arabia	-	13	-	n/s	Multiple grades	322	81	Al-Turki	2006	58
Saudi Arabia	-	33	-	n/s	Cross-sectional	414	100	Jarallah	1992	59
Scotland	-	23	17	n/s	Cross-sectional	566	n/s	Engs and Teijlingen	1997	60
Slovak Republic	36	-	-	1st and 5th Yrs	Multiple grades	185	98	Kavcova *et al.*	2004	61
Spain	37	-	-	n/s	Single Grade	41	100	San-Pedro *et al.*	2006	62
Spain	44	42	45	All (Yrs 1-5)	Cross-sectional	2308	40	Rodriguez and Cami	1986	63
Thailand	7	-	0	Yrs 3-6	Multiple grades	256	n/s	Songkla and Saenghirunvattana	1985	64
Tunisia	19	30	1	1st and 5th Yrs	Multiple grades	230	74	Harrabi *et al.*	2006	65
Turkey	32	39	22	1st and 6th Yrs	Multiple grades	447	68-91	Akvardar *et al.*	2003	66
Turkey	22	28	10	1st Year	Longitudinal	126	98	Senol *et al.*	2006	67
Turkey	-	31	10	1st,4th,6th Yrs	Multiple grades	3073	88	Kocabas *et al.*	1994	68
Turkey	33	-	-	All (Yrs 1-6)	Cross-sectional	690	89	Gulec *et al.*	2005	69
Tuscany	30	40	25	1st Year	Single grade	200	94	Melani *et al.*	2000	70
United Kingdom	-	18	14	2nd Year	Single grade	785	100	Webb *et al.*	1998	71
United Kingdom	-	12	30	2nd Year	Single grade	186	99	Ashton and Kamali	1995	72
United Kingdom	17	18	15	All (Yrs 1-5)	Cross-sectional	1112	96	Elkind	1982	73
United Kingdom	35	-	-	2nd and 5th Yrs	Multiple grades	134	67-91	Birkner and Kunze	1978	74
United States	3	-	-	All (Yrs 1-4)	Cross-sectional	397	48	Patkar *et al.*	2003	75
United States	2	-	-	(Yrs 1-4) x 17	Cross-sectional	5744	n/s	Sockrider *et al.*	1998	76
United States	2	3	2	(4th Year) x 8	Single grade	548	55	Mangus *et al.*	1998	77
United States	7	-	-	All (Yrs 1-4)	Cross-sectional	105	50	Najem *et al.*	1995	78

Table 1: (Continued) International comparison of tobacco smoking surveys conducted among medical students between 1976 and 2006

Smoking rate[a]				Details of study[b]				Publication details[c]		
Country	All	Male	Female	Grades	Design	N	Response	Authors	Year	Reference
United States	10	-	-	4th Year	Single grade	2046	67	Baldwin *et al.*	1991	79
United States	5	-	-	(4th Year) x 13	Single grade	589	41	Conard *et al.*	1988	80
Yugoslavia	31	36	28	All (Yrs 1-5)	Cross-sectional	1657	54	Vlajinac *et al.*	1989	81

[a]Smoking rates listed by country and gender and rounded to the nearest whole number, [b]Study details including grade of student at medical school, study design, total number of participants and survey response rate (where the authors had used a convenience sample with an unspecified response rate or where the response rate could not be located, this information is indicated on the table as n/s [not supplied]), [c]Publication details including the first authors of the study, the publication year and the reference number as listed in this manuscript

large sample sizes (in the hundreds) and sufficiently high response rates to allow confidence in the published data. In this regard, 75% of the studies we reviewed had obtained survey response rates between 74% and 97%. Aside from response rates, results from surveys conducted among a cross-section of students at a single medical school also permit some analysis of the changing nature of smoking as students progress through their course of study.

The prevalence of smoking among medical students appears to vary widely from country to country. From the current review it appears that smoking rates among male medical students range between 3% in the United States[77] and 58% in Japan.[49] The lowest overall prevalence rates of 2-3% were documented in American medical schools during the late 1990s,[75-77] with similar low levels also reported in Australia (3%),[17] China (3%)[26] and India (4%).[37] Smoking prevalence rates below 10% of the medical student population were shown to occur in Australia (4-6%),[18-21] China (6%),[24] India (7%),[41] Thailand (7%),[64] the US (7%)[78] and Malaysia (9%).[51,52] Marked differences in smoking rates were found by gender in almost all studies, with male students generally having the higher rates. Other relatively high prevalence rates among male medical students were also reported in Greece (41%)[30] and Spain (42%).[63] When considering the prevalence of smoking among medical students in a particular country, it is worthwhile considering to what extent their habits mirror those of the society in which they live. In the current review, as mentioned earlier, medical students in the United States, Australia, China and India were the least likely to smoke. This finding is consistent with population data from the WHO,[1] where it is reported that only 18-21% of Australian adults and 21-26% of American adults consume tobacco. On the other hand, the seemingly low rate of smoking among Chinese medical students is contrary to recent population data from the WHO, details of which are published elsewhere.[1] The high proportion of tobacco users that we identified among medical students in Japan, Greece and Spain, appears to reflect current population estimates for these countries, where it is reported that 39-47% of adult males and 12-29% of adult females still smoke tobacco.

While the smoking prevalence rate among female medical students was generally lower than their male counterparts at the same medical school across a range of studies, at least seven investigations reported not having any female smokers at all. This particular phenomenon was evident in China,[24,25] India,[37,43] Malaysia[51,52] and Thailand.[64] It has been previously suggested that smoking may be regarded as inappropriate behavior for women in certain countries,[5,83] a cultural consideration which may have led to the situation observed among female medical students in the current review. Nevertheless, it is also possible that some females who did actually smoke in certain countries may not have admitted their smoking habit during the survey, for these cultural reasons. Aside from countries where the smoking prevalence among female medical students was reported to be either zero or was not recorded at all, very low smoking prevalence rates of only 1% were also documented among female students in China,[26] Malaysia,[53] Pakistan[57] and Tunisia.[65] Again, these low results seem to suggest a cultural reluctance for women to smoke in certain countries. Such hypotheses are supported by marked gender differences in population smoking rates in India, where 30% of males but only 3% of females smoke and in China, where the WHO estimates that smoking ranges from 4% in adult Chinese females to 53% among adult Chinese males.[1]

Aside from gender issues, the results of cross-sectional tobacco smoking studies are also interesting to consider, as they help elucidate changes in smoking behavior as a student progresses through medical school. As previously mentioned, our current review located numerous studies which had been conducted among a cross-section of students at the same medical school. Almost all of them found that tobacco smoking rates among medical students tend to increase between the year of entry and the final year. In India for example, Ramakrishna *et al.*[37] reported that the tobacco smoking prevalence ranged from 7% among the male first-year students to 16% among the fifth-year students. Also in India, Singh *et al.*[40] found that smoking rates increased from 17% to 43% between the first and fifth years, while Sandell *et al.*[42] observed a similar trend, albeit with lower overall prevalence rates (ranging from 4% in the first year to 10% in the fourth and fifth years). An earlier Indian study from the late 1970s conducted by Singh *et al.*[44] suggested that smoking prevalence rates in the 1970s also followed a similar trend (ranging from 27% in the first year to 49% by the intern period). Research conducted in Manchester by Elkind[73] documented the prevalence rate rising from 16% in the first year to 20% in the fifth year. Similarly, in Yugoslavia, Vlajinac *et al.*[81] demonstrated that smoking rates increased from 27% to 36% during the five years of medical school. Not all studies of tobacco usage among medical students demonstrated a linear trend of increasing prevalence, however. In the United

States for example, Patkar *et al*[75] found that tobacco smoking rates fluctuated from 3.3% in the first year, to 2.5% in the second year and then back up to 3.8% in the third and fourth years. In Iran, Ahmadi *et al.*[45] also revealed that tobacco usage ranged from 18% in the first-year group, to 7% in the third-year group and then back up to 17% in the fourth-year group. Considering the results of previous investigations and the fact that response rates were not mentioned, the possibility of demographic differences in the third year group of Ahmadi *et al*'s[45] study, should be considered.

Our current review located several longitudinal studies of tobacco smoking which had been conducted on medical students in Australia,[18] India,[39,41] Ireland,[46] Japan,[47] Malaysia[51] and Turkey.[67] In the first study, Roche[18] targeted three separate groups of male and female students in their fifth year of study at an Australian medical school. Surveys were conducted in 1986, 1990 and 1993, with response rates of 65%, 73% and 68%, respectively. The prevalence of smoking among them steadily declined over the eight-year period, beginning at 10% in 1986, falling to 4% in 1990 and then to 3% in 1993.[18] In another study, Venkataraman *et al*[39] investigated 10 successive groups of male students enrolled at an Indian medical school between 1955 and 1988. Similar to Roche,[18] the Indian authors also found that the overall prevalence of smoking was on the decline, falling from 42% (in the period 1955-60) to 25% (in the period 1985-1988).[39] Boland *et al*[46] followed three separate groups of male and female students at an Irish medical school between 1973 and 2002. The 1973 investigation targeted students in their first, third, fourth and sixth year of study, while in 1990 and 2002 all six years of the medical school were surveyed. The overall prevalence of smoking declined from 29% in 1973, to 15% in 1990 and then 10% in 2002.[46] In Malaysia, Frisch *et al*:[51] recruited a cohort of male and female medical students in their first year of study during 1991-92, following them up two years later in the 1993-94 school year. Unlike the three previous investigations, the prevalence of smoking among this Malaysian cohort actually increased from 9% to 11% during the follow-up period. Interestingly, all smokers were male, with no female smokers in either group.[51] Again, this finding suggests a possible cultural reluctance for women to smoke in certain countries, as previously described.[83]

The most recent longitudinal study of tobacco smoking among medical students appears to have been conducted in Turkey by Senol and colleagues.[67] In their investigation, 22% of students (male and female) were smoking in the first year of study, a rate which had risen to 27% by the sixth year. Roughly one-third (32.3%) of Senol *et al's*[67] original nonsmokers in the first year had also become smokers by the end of the sixth year at medical school. While it would no-doubt have been useful to compare the smoking habits of undergraduate medical students with postgraduate medical students, few if any researchers appear to have done so. A Japanese investigation of this nature was conducted by Imai *et al* in 2003,[84] but it was published in Japanese and therefore had to be excluded from the current review. Even so, in order to meet the current information shortfall, future international researchers who look at tobacco smoking among medical students would probably benefit by expanding their study to include a more comprehensive survey of the demographic wherever possible.

Conclusions

Overall, our review suggests that the prevalence of smoking among medical students varies widely between students of different countries and also between male and female students within the same countries. Consistently low prevalence rates were documented in regions such as Australia and the United States, while generally high rates were seen in countries such as Spain and Turkey. While many cross-sectional investigations suggested that the prevalence of smoking seems to increase during the more senior grades, it is difficult to assess whether this trend directly reflects university seniority, increasing age or both. Some other conflicting results were also found. Various researchers for example, have suggested that the smoking habits of parents may be very important in influencing whether a medical student smokes.[81,85] On the other hand, other researchers found no association between whether students smoked at medical school and whether their parents were smokers.[86] As such, it is worthwhile considering a few key issues, such as what factors contribute to smoking in particular countries and also why medical students choose to smoke tobacco at all. In this regard, social, cultural and other country-specific factors no-doubt strongly influence whether a medical student in that particular region smokes tobacco. As previously described, most studies that reported low rates of smoking among medical students had concurrently low rates of tobacco usage in their general population. Where major gender differences existed in smoking rates among medical students, a similar phenomenon was, for the most part, also present within the general community in which they lived. The importance of population-based influences on a medical student's decision to smoke, therefore, is clear.

Cognitive dissonance may also play a role for student smokers. In one of the earliest studies of smoking among medical students, Mausner[7] reported that significantly more nonsmokers than smokers accepted that evidence linking tobacco usage and disease was 'strongly convincing'. In this regard, medical students in some countries may still believe that smoking is not particularly hazardous or at least, not hazardous enough to warrant quitting. In a comprehensive survey of smoking among European medical students for example,[9] it was noted that there was limited overall knowledge regarding public health measures for tobacco control. Future population-based reduction strategies will, therefore, need to consider not only smoking among youth, but also smoking among specific young adult populations such as university students. Their motivations for taking up smoking and not quitting may or may not reflect those of the general adult communities in which they live.

Whatever the underlying demographic correlates of tobacco usage in this distinct sub-population, it is clear from the current review that too many medical students continue to use tobacco. Given their important future role as exemplars, there are a few

measures which will need to be considered in meeting this important public health dilemma. Education represents probably the most critical issue in smoking cessation for both medical students and the general public alike. It has previously been noted that educating both physicians and medical students about the importance of smoking as a cause of disease represents the first step for getting them involved in smoking cessation.[87] While medical schools should clearly provide educational programs in this regard,[88] it has been suggested that not enough medical schools actually teach specific courses on tobacco control.[89] Not doing so may allow an entrenched smoking culture to remain among the student demographic and thus jeopardize their future role as physicians responsible for tobacco control programs. In Japan, for example, a country with some of the highest historical and contemporary smoking rates among adults, Kawakami[90] demonstrated that the intention of medical students to perform future smoking interventions was still unsatisfactory in the late 1990s, with only one-third even being actively interested in the topic. While medical schools should clearly be encouraged to address this important issue, not all of them appear to be doing so. A previous worldwide survey on the topic, for example, suggested that some medical schools still need continued encouragement for undertaking adequate tobacco control education.[91] Postgraduate training in tobacco control represents a key step forward in this regard, as it has previously been suggested that this represents a time when basic medical education is actually completed.[92]

General strategies for promoting tobacco control among young people have also been proposed by the WHO's Tobacco-Free Initiative[1] and its particular publications on tobacco smoking among the world's younger population.[93] Many of these strategies are applicable for use among medical students. Firstly, it has been noted that a comprehensive mix of anti-smoking legislation, pricing and community-based strategies can be effective in reducing tobacco consumption among youth. As most university students including those at medical school would have limited financial means, it is reasonable to assume that any legislation increasing the price of tobacco would subsequently result in a drop in the overall number of student smokers. Secondly, there needs to be a stronger focus on positive youth development during the transition from youth into adulthood.[93] This issue could be incorporated into medical education to help students as they progress through their course and mature from undergraduate students into young doctors. As smoking rates appear to increase by year of study, this type of transition-focused approach is urgently needed in medical schools worldwide. Considering these facts, the role of medical schools in tobacco control programs *to help their own students stop smoking*, simply cannot be overlooked. Regardless of when medical educators actually begin teaching their students about tobacco control, it seems clear from the current review that tobacco-specific education should become mandatory in future years.

References

1. World Health Organization (WHO). Tobacco Free Initiative (TFI) Website. [cited on 2006 Oct]. Available from: http://www.who.int/tobacco/en/.
2. Roche AM, Eccleston P, Sanson-Fisher R. Teaching smoking cessation skills to senior medical students: A block-randomized controlled trial of four different approaches. Prev Med 1996;25:251-8.
3. Saloojee Y, Steyn K. Educating medical students about tobacco. S Afr Med J 2005;95:330-1.
4. Davis RM. When doctors smoke. Tob Control 1993;2:187-8.
5. Richmond R. Teaching medical students about tobacco. Thorax 1999;54:70-8.
6. Flaherty JA, Richman JA. Substance use and addiction among medical students, residents and physicians. Psychiatr Clin North Am 1993;16:189-97.
7. Mausner JS. Smoking in medical students. A survey of attitudes, information and smoking habits. Arch Environ Health 1966;13:51-60.
8. Brackenridge CJ, Bloch S. Smoking in medical students. J Psychosom Res 1972;16:35-40.
9. Tessier JF, Freour P, Crofton J, Kombou L. Smoking habits and attitudes of medical students towards smoking and antismoking campaigns in fourteen European countries. Eur J Epidemiol 1989;5:311-21.
10. Tessier JF, Freour PP, Nejjari C, Belougne D, Crofton J. Smoking behaviour and attitudes of medical students towards smoking and anti-smoking campaigns: A survey in ten African and Middle Eastern countries. Tob Control 1992;1:95-101
11. Tessier JF, Freour P, Belougne D, Crofton J. Smoking habits and attitudes of medical students towards smoking and antismoking campaigns in nine Asian countries. Int J Epidemiol 1992;21:298-304.
12. Tessier JF, Freour PP, Nejjari C, Belougne D, Crofton J. Smoking behaviour and attitudes towards smoking of medical students in Australia, Japan, USA, Russia and Estonia. Tob Control 1993;2:24-9.
13. Crofton JW, Freour PP, Tessier JF. Medical education on tobacco: Implications of a worldwide survey. Tobacco and Health Committee of the International Union against Tuberculosis and Lung Disease (IUATLD). Med Educ 1994;28:187-96.
14. Centers for Disease Control and Prevention (CDC). Tobacco use and cessation counseling - Global health professionals survey pilot study, 10 countries, 2005. MMWR Morb Mortal Wkly Rep 2005;54:505-9.
15. National Library of Medicine, United States. Entrez PubMed Database. [cited on 2006 Sep]. Available from: http://www.ncbi.nlm.nih.gov/entrez.
16. Vekeflliu Y, Argjiri D, Peposhi I, Agron S, Melani AS. Tobacco smoking habits, beliefs and attitudes among medical students in Tirana, Albania. Prev Med 2002;34:370-3.
17. Richmond RL, Kehoe L. Smoking behaviour and attitudes among Australian medical students. Med Educ 1997;31:169-76.
18. Roche AM. Have efforts to improve medical students' drug and alcohol knowledge, skills and attitudes worked? Drug Alcohol Rev 1997;16:157-70.
19. Roche AM, Eccleston P, Jordan D. Smoking-related knowledge and attitudes of senior Australian medical students. Tob Control 1996;5:271-9.
20. Roche AM, Beauchamp P. Smoking prevalence among senior medical students. Med J Aust 1994;160:447-8.
21. Engs RC. The drug-use patterns of helping-profession students in Brisbane, Australia. Drug Alcohol Depend 1980;6:231-46.
22. Daudt AW, Alberg AJ, Prola JC, Fialho L, Petracco A, Wilhelms A, *et al.* A first step incorporating smoking education into a Brazilian medical school curriculum: Results of a survey to assess the cigarette smoking knowledge, attitudes, behaviour and clinical practices of medical students. J Addict Dis 1999;18:19-29.
23. Paine PA, Amaral JA, Pereira MG. Association between parental and student smoking behaviour in a Brazilian medical school. Int J Epidemiol 1985;14:330-2.
24. Smith DR, Wei N, Wang RS. Tobacco smoking habits among Chinese medical students and their need for health promotion initiatives. Health Promot J Austr 2005;16:233-5.
25. Xiang H, Wang Z, Stallones L, Yu S, Gimbel HW, Yang P. Cigarette smoking among medical college students in Wuhan, People's Republic of China. Prev Med 1999;29:210-5.
26. Lei Z, Jingheng H, Jianzhong L. Smoking among Shanghai medical

students and the need for comprehensive intervention strategies. Health Promot Int 1997;12:27-32.
27. Rosselli D, Rey O, Calderon C, Rodriguez MN. Smoking in Colombian medical schools: The hidden curriculum. Prev Med 2001;33:170-4.
28. Trkulja V, Zivcec Z, Cuk M, Lackovic Z. Use of psychoactive substances among Zagreb University medical students: Follow-up study. Croat Med J 2003;44:50-8.
29. Brenner H, Scharrer SB. Parental smoking and sociodemographic factors related to smoking among German medical students. Eur J Epidemiol 1996;12:171-6.
30. Sichletidis LT, Chloros D, Tsiotsios I, Kottakis I, Kaiafa O, Kaouri S, *et al*. High prevalence of smoking in Northern Greece. Prim Care Respir J 2006;15:92-7.
31. Mammas IN, Bertsias GK, Linardakis M, Tzanakis NE, Labadarios DN, Kafatos AG. Cigarette smoking, alcohol consumption and serum lipid profile among medical students in Greece. Eur J Public Health 2003;13:278-82.
32. Dekker HM, Looman CW, Adriaanse HP, Van Der Maas PJ. Prevalence of smoking in physicians and medical students and the generation effect in the Netherlands. Soc Sci Med 1993;36:817-22.
33. Waalkens HJ, Cohen Schotanus J, Adriaanse H, Knol K. Smoking habits in medical students and physicians in Groningen, The Netherlands. Eur Respir J 1992;5:49-52.
34. Piko BF. Does knowledge count? Attitudes toward smoking among medical, nursing and pharmacy students in Hungary. J Community Health 2002;27:269-76.
35. Piko B, Barabas K, Markos J. Health risk behaviour of a medical student population: Report on a pilot study. J R Soc Health 1996;116:97-100.
36. Mohan S, Pradeepkumar AS, Thresia CU, Thankappan KR, Poston WS, Haddock CK, *et al*. Tobacco use among medical professionals in Kerala, India: The need for enhanced tobacco cessation and control efforts. Addict Behav 2006;31:2313-8.
37. Ramakrishna GS, Sankara Sarma P, Thankappan KR. Tobacco use among medical students in Orissa. Natl Med J India 2005;18:285-9.
38. Sinha DN, Gupta PC. Tobacco and areca nut use in male medical students of Patna. Natl Med J India 2001;14:176-8.
39. Venkataraman S, Mukhopadhya A, Muliyil J. Trends of smoking among medical students. Indian J Med Res 1996;104:316-20.
40. Singh SK, Narang RK, Chandra S, Chaturvedi PK, Dubey AL. Smoking habits of the medical students. Indian J Chest Dis Allied Sci 1989;31:99-103.
41. Behera D, Malik SK. Smoking habit of undergraduate medical students. Indian J Chest Dis Allied Sci 1987;29:182-4.
42. Sandell J, Singh S, Sati TK, Mehrotra SK. A study of smoking habits of medical students of Uttar Pradesh. Indian J Public Health 1983;27:96-101.
43. Roy M, Chakraborty AK. Smoking and drug-abuse among the newly admitted students of medical colleges in West Bengal. Indian J Public Health 1981;25:30-5.
44. Singh G, Singh R, Jindal KC. Drug use among physicians and medical students. Indian J Med Res 1981;73:594-602.
45. Ahmadi J, Khalili H, Jooybar R, Namazi N, Aghaei PM. Cigarette smoking among Iranian medical students, resident physicians and attending physicians. Eur J Med Res 2001;6:406-8.
46. Boland M, Fitzpatrick P, Scallan E, Daly L, Herity B, Horgan J, *et al*. Trends in medical student use of tobacco, alcohol and drugs in an Irish university, 1973-2002. Drug Alcohol Depend 2006;85:123-8.
47. Ozasa K, Shigeta M, Hayashi K, Yuge M, Watanabe Y. Smoking prevalence in Japanese medical students, 1992-2004. Med Educ 2005;39:971-2.
48. Kusunoki T, Hosoi S, Asai K, Harazaki M, Furusho K. Relationships between atopy and lung function: Results from a sample of one hundred medical students in Japan. Ann Allergy Asthma Immunol 1999;83:343-7.
49. Kawane H. Antismoking education for medical students. Chest 1992;101:1480.
50. Kawane H. Tobacco smoking in Japan. Med J Aust 1987;146:503-4.
51. Frisch AS, Kurtz M, Shamsuddin K. Knowledge, attitudes and preventive efforts of Malaysian medical students regarding exposure to environmental tobacco and cigarette smoking. J Adolesc 1999;22:627-34.
52. Yaacob I, Abdullah ZA. Smoking behavior, knowledge and opinion of medical students. Asia Pac J Public Health 1994;7:88-91.
53. Wong ML, Chen PC. Smoking behaviour, knowledge and opinion of medical students. Med J Malaysia 1989;44:317-23.
54. Khan FM, Husain SJ, Laeeq A, Awais A, Hussain SF, Khan JA. Smoking prevalence, knowledge and attitudes among medical students in Karachi, Pakistan. East Mediterr Health J 2005;11:952-8.
55. Omair A, Kazmi T, Alam SE. Smoking prevalence and awareness about tobacco related diseases among medical students of Ziauddin Medical University. J Pak Med Assoc 2002;52:389-92.
56. Hussain SF, Moid I, Khan JA. Attitudes of Asian medical students towards smoking. Thorax 1995;50:996-7.
57. Ahmed EN, Jafarey NA. Smoking habits amongst medical students of Sind Medical College. J Pak Med Assoc 1983;33:39-44.
58. Al-Turki YA. Smoking habits among medical students in Central Saudi Arabia. Saudi Med J 2006;27:700-3.
59. Jarallah JS. Smoking habits of medical students at King Saud University, Riyadh. Saudi Med J 1992;13:510-3.
60. Engs RC, Van Teijlingen E. Correlates of alcohol, tobacco and marijuana use among Scottish postsecondary helping-profession students. J Stud Alcohol 1997;58:435-44.
61. Kavcova E, Kocan I, Squier C. Tobacco control and the role of the medical community in the Slovak Republic. Eur J Dent Educ 2004;8:46-50.
62. San-Pedro EM, Roales-Nieto JG, Blanco-Coronado JL. Tobacco use among Spanish physicians and medical students. Tob Control 2006;15:272.
63. Rodriguez ME, Cami J. Substance use among medical students in Barcelona (Spain). A comparison with previous surveys. Drug Alcohol Depend 1986;18:311-8.
64. Songkla YN, Saenghirunvattana S. Smoking among medical students. J Med Assoc Thailand 1985;68:198-200.
65. Harrabi I, Ghannem H, Kacem M, Gaha R, Ben Abdelaziz A, Tessier JF. Medical students and tobacco in 2004: A survey in Sousse, Tunisia. Int J Tuberc Lung Dis 2006;10:328-32.
66. Akvardar Y, Demiral Y, Ergor G, Ergor A. Substance use among medical students and physicians in a medical school in Turkey. Soc Psychiatry Psychiatr Epidemiol 2004;39:502-6.
67. Senol Y, Donmez L, Turkay M, Aktekin M. The incidence of smoking and risk factors for smoking initiation in medical faculty students: Cohort study. BMC Public Health 2006;6:128.
68. Kocabas A, Burgut R, Bozdemir N, Akkoclu A, Cildag O, Dagli E, *et al*. Smoking patterns at different medical schools in Turkey. Tob Control 1994;3:228-35.
69. Gulec M, Bakir B, Ozer M, Ucar M, Kilic S, Hasde M. Association between cigarette smoking and depressive symptoms among military medical students in Turkey. Psychiatry Res 2005;134:281-6.
70. Melani AS, Verponziani W, Boccoli E, Trianni GL, Federici A, Amerini R, *et al*. Tobacco smoking habits, attitudes and beliefs among nurse and medical students in Tuscany. Eur J Epidemiol 2000;16:607-11.
71. Webb E, Ashton CH, Kelly P, Kamah F. An update on British medical students' lifestyles. Med Educ 1998;32:325-31.
72. Ashton CH, Kamali F. Personality, lifestyles, alcohol and drug consumption in a sample of British medical students. Med Educ 1995;29:187-92.
73. Elkind AK. Changes in the smoking behaviour, knowledge and opinion of medical students, 1972-1981. Soc Sci Med 1982;16:2137-43.
74. Birkner FE, Kunze M. Smoking patterns at a British and at an American medical school. Med Educ 1978;12:128-32.
75. Patkar AA, Hill K, Batra V, Vergare MJ, Leone FT. A comparison of smoking habits among medical and nursing students. Chest 2003;124:1415-20.
76. Sockrider MM, Maguire GP, Haponik E, Davis A, Boehlecke B. Attitudes of respiratory care practitioners and students regarding pulmonary prevention. Chest 1998;114:1193-8.
77. Mangus RS, Hawkins CE, Miller MJ. Tobacco and alcohol use among 1996 medical school graduates. JAMA 1998;280:1192-3,5.
78. Najem GR, Passannante MR, Foster JD. Health risk factors and health promoting behavior of medical, dental and nursing students. J Clin Epidemiol 1995;48:841-9.
79. Baldwin DC Jr, Hughes PH, Conard SE, Storr CL, Sheehan DV.

Substance use among senior medical students. A survey of 23 medical schools. JAMA 1991;265:2074-8.
80. Conard S, Hughes P, Baldwin DC Jr, Achenbach KE, Sheehan DV. Substance use by fourth-year students at 13 U.S. medical schools. J Med Educ 1988;63:747-58.
81. Vlajinac H, Adanja B, Jarebinski M. Cigarette smoking among medical students in Belgrade related to parental smoking habits. Soc Sci Med 1989;29:891-4.
82. Smith DR, Leggat PA. A comparison of tobacco smoking among dentists in 15 countries. Int Dent J 2006;56:283-8.
83. Ernster V, Kaufman N, Nichter M, Samet J, Yoon SY. Women and tobacco: Moving from policy to action. Bull World Health Organ 2000;78:891-901.
84. Imai H, Konno K, Musashi M, Tamashiro H. A survey on smoking behavior in Hokkaido University School of Medicine, 2003. Nippon Koshu Eisei Zasshi 2004;51:540-51.
85. Brenner H, Scharrer S. Smoking habits of future physicians: A survey among medical students of a south German university. Soz Praventivmed 1996;41:150-7.
86. Pathmanathan I. Smoking habits among medical students in the University of Malaya. Med J Malaysia 1975;30:88-92.
87. Fowler G. Educating doctors in smoking cessation. Tob Control 1993;2:5-6.
88. Wallace P. Medical students, drugs and alcohol: Time for medical schools to take the issue seriously. Med Educ 2000;34:86-7.
89. Allen MB. Medical students' knowledge of smoking. Thorax 1999;54:2.
90. Kawakami M. Awareness of the harmful effects of smoking and views on smoking cessation intervention among Japanese medical students. Intern Med 2000;39:720-6.
91. Richmond RL, Debono DS, Larcos D, Kehoe L. Worldwide survey of education on tobacco in medical schools. Tob Control 1998;7:247-52.
92. Roche AM, Sanson-Fisher RW, Cockburn J. Training experiences immediately after medical school. Med Educ 1997;31:9-16.
93. World Health Organization (WHO). What in the World Works? International Consultation on Tobacco and Youth: Final Conference Report. WHO: Geneva; 2000.

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A systematic review of tobacco smoking among nursing students

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Smoking;
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Summary This study was conducted to systematically and critically evaluate the large number of academic publications which have investigated tobacco smoking among nursing students in recent years. It was performed as a state-of-the-art examination of all modern literature published in peer-reviewed, English-language journals since 1990. Although smoking appears to be fairly common among nursing students, its prevalence and distribution varies widely depending on the country of study and time period during which the research was undertaken. Although there is some evidence to suggest that smoking rates increase by year of study in the nursing course, not all research has shown a clear association in this regard. Similarly, the value of anti-smoking interventions for nursing students appears to be limited, based on currently available information. Given these conflicting issues, further research which helps to ascertain why student nurses do not wish to give up their habit is clearly needed both locally and internationally. The development of an international smoking questionnaire may also be useful to help standardize future research on tobacco usage among this vulnerable demographic.

Introduction

Although nurses are the largest professional group in health care, the rate of tobacco usage among them is known to be considerable (Adriaanse et al., 1991). This represents a major public health issue as nurses are significant community role models for smoking and other lifestyle factors. Many smokers will inevitably consult nurses for tobacco-related advice (Charlton et al., 1997). Nursing students also play a major role in smoking prevention, as many of their attitudes towards tobacco-related activities are developed during training (Baron-Epel et al., 2004). Previous studies have shown that a nursing student's intended preventive behaviour may be influenced by their own smoking habits,

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with those who smoke being less likely to give anti-smoking advice to future patients (Sejr and Osler, 2002). For these reasons, tobacco smoking represents a very important issue for nursing students, and one which has led to a large number of investigations being conducted in recent years. Nevertheless, the quality of smoking research among them has varied over time, and some inconsistent results have been revealed.

Aim of this review

Given the increasing number of investigations which have recently been conducted, this systematic review was undertaken to help establish the prevalence, distribution and related factors for student tobacco smoking from an international perspective.

Method

This systematic review was conducted as a state-of-the-art examination of all modern literature published in peer-reviewed nursing journals, relating to the topic of tobacco smoking among nursing students. As the nature of research changes over time and results quickly go out of date, it was considered necessary to only include manuscripts published since 1990. For consistency, it was also decided that only English-language manuscripts would be included.

Literature search strategy

The initial literature review began with a Medline search of relevant MeSH (Medical Subject Headings) terms such as: 'smoking', 'tobacco', 'student' and 'nurse.' After identifying some preliminary studies, the search was repeated using variations of these key words such as 'smoke', 'students' and 'nursing'. For the aforementioned reasons, the search criteria were limited to language 'English' and date '1990 onwards'. From the initial searches, it was noted that although a surprisingly large number of epidemiological studies have investigated tobacco smoking among nursing students, many of the reports which were eventually included had not been easily located using basic searches. There were a few reasons for this. One major limitation when using common search engines is that not all nursing periodicals are listed on medical databases, particularly some of the older studies. Indeed it has been suggested that only 31 of approximately 6000 nursing journals in the world today are actually listed in the Institute of Scientific Information (ISI) Journal Citation Reports (Melby, 2005). This suggests that any nursing literature review which locates its materials through search engines alone would clearly miss some important articles.

Another methodological issue, not only limited to the current study, is that biomedical research tends to have a general bias towards countries with higher economic ranking (Rahman and Fukui, 2003). For both of these reasons, it was considered necessary to examine the reference lists of all manuscripts initially fitting the above-mentioned criteria, in order to locate additional publications which were not initially listed on search engines. Another confounding factor across all investigations was a lack of standardisation regarding the definition of 'current smoker'. Although most studies referred to their subjects simply as being either 'current' smokers or not, some used recall periods of 1 week to 1 month in their definition of the term 'current'. This may have arisen due to the inherent difficulties in assessing smoking habits over time, and the fact that most investigations simply describe the point-prevalence of smoking within a certain group. In cases where there was ambiguity regarding smoking definition, composition of the student sample or research design; the corresponding author of the selected manuscript was contacted. No corresponding authors were contacted prior to the literature search, nor were any encouraged to submit their own work for inclusion in the review, prior to being contacted.

Stratification of results

Although this review systematically targeted publications from a variety of countries with a range of different methods, four main categories of research study were identified. Firstly, there were investigations where all grades an entire nursing school were surveyed at one point in time (complete cross-sectional studies). Second, were the studies targeting single or multiple grades of student, but which did not include the entire nursing school (single or multiple grade studies). Research conducted on a single cohort of students at one particular time and then followed up at a later date was also included (longitudinal studies), as too; investigations where a specific intervention was provided to help reduce smoking among nursing students (intervention studies). Given these clear distinctions in research methodologies, main re-

sults from this review are displayed as four separate tables corresponding to these four methodological classifications. To standardise results throughout, smoking rates were listed as the prevalence of smoking among the entire group (males and females combined), all percentages of which were rounded to the nearest whole number. Response rates for each study were also rounded to the nearest whole number for standardisation purposes.

Results

Main findings

A total of 35 English-language studies which met the inclusion criteria had been published since 1990. Eleven were cross-sectional in design, 16 single or multiple grade, 5 longitudinal and 3 interventional. Refer to Tables 1–4. One initial finding was the relatively large number of studies which have investigated tobacco smoking among nursing students, as well as the generally large sample sizes (up to 3866) (Suzuki et al., 2005) and high response rates they obtained (up to 100%) (CDC, 2005; Sone, 1997). As expected, there was a tendency for almost all studies to have been conducted in developed nations, which is consistent with the observations mentioned earlier (Rahman and Fukui, 2003) and one which represents a ubiquitous limitation of epidemiological research in the modern world. Although many studies originated from the United States and the United Kingdom, a surprisingly large number had also been conducted in Japan, all of which were high quality.

Complete cross-sectional studies

The most accurate 'snapshot' of tobacco smoking prevalence was obtained by the complete cross-sectional studies, as indicated in Table 1. From the publications located during this literature review, a number of important issues were established with regard to smoking prevalence. Firstly, the overall prevalence of smoking appears to vary widely, both from country to country and from year to year. In Iran for example Ahmadi et al. (2004) revealed that only 3% of nursing students were smokers, whereas in Israel (Baron-Epel et al., 2004) and Greece (Krommydas et al., 2004) the rate was 22% and 36%, respectively; even though all three studies were conducted in the same year. Interestingly, two Japanese investigations also showed wide variations in prevalence, with Sekijima et al. (2005) documenting a very low smoking rate of only 6%, whereas Suzuki et al. (2005) found a four times higher level in their study (24%). Both Japanese researchers achieved very high response rates during their surveys (96% and 93%, respectively), suggesting that responder bias was not the reason. Possible reasons for the discrepancy may relate to the different demographics from which their samples were sourced; that is, the inherent differences between students who study nursing at a vocational college or those who study at universities. Either way, both Japanese studies revealed that smoking prevalence increased by year of study, with students in the senior grades smoking at higher rates than their junior colleagues. In the United States, Najem et al. (1995) also found that postgraduate nursing students smoked at higher rates when compared to undergraduates. Such findings may not be definitive however, with Charlton et al. (1997) revealing that tobacco use was actually more common among the first year nursing students of their particular study. West and Hargreaves (1995) also showed that although smoking beliefs did not change during training, the overall prevalence decreased. Based on the findings of cross-sectional studies alone, it is difficult to ascertain whether smoking actually increases or decreases by year of study in the nursing course.

Seniority in the nursing course was not the only contentious issue however. In Scotland for example, Blakey and Seaton (1992) found that a small proportion of nursing students believed smoking was *not* very harmful to health. Similarly in Greece, Krommydas et al. (2004) revealed that smoking was actually *more* common among nursing students with asthma when compared to their non-asthmatic classmates, and that the overall rate was quite high (36%). The highest smoking rates appear to have been in Italy (Boccoli et al., 1996) and Great Britain (Carmichael and Cockcroft, 1990), where roughly half the students used tobacco (51% and 43%, respectively). In some studies, nursing students' smoking habits were associated with gender (Baron-Epel et al., 2004; Ahmadi et al., 2004) and other demographic items (Baron-Epel et al., 2004). A student's potential role in helping patients to quit may also be controversial, as Boccoli et al. (1996) found that only one quarter of their nursing students believed medical smoking cessations would be effective. Interestingly, the possibility of responder bias in smoking surveys has also been revealed by Carmichael and Cockcroft (1990), who found that the prevalence of smoking was lowest among students who responded to the first mailing of their questionnaire. Despite

Table 1 Complete cross-sectional studies of tobacco smoking among nursing students

References	Country	Smoking rate (%)[a]	Setting	Grade	Sample size	Response rate (%)[b]	Main findings
Suzuki et al. (2005)	Japan	24	27 Vocational nursing schools	All (years 1–3)	3866	93	Smoking prevalence increased by year of study in the nursing course
Sekijima et al. (2005)	Japan	6	2 Nursing colleges and 1 university	All (years 1–4)	716	96	Smoking prevalence increased by year of study in the nursing course
Krommydas et al. (2004)	Greece	36	1 University	All (years 1–4)	268	98	Smoking was more common among nursing students with asthma
Baron-Epel et al. (2004)	Israel	22	3 Universities	All (years 1–4)	782	69	Smoking was associated with gender, ethnicity and religiosity
Ahmadi et al. (2004)	Iran	3	1 University	All (years 1–4)	400	93	Smoking was associated with gender (much higher among males)
Charlton et al. (1997)	Great Britain	28	1 University	All (years 1–4)	96	72	The prevalence of smoking was highest amongst first-year students
Boccoli et al. (1996)	Italy	51	1 Nursing school	All (years 1–3)	662	88	Only 1/4 thought medical smoking cessations would be effective
Najem et al. (1995)	United States	11	1 University	All (years 1–4)	229	45	A higher smoking rate was seen among post-graduate nursing students
West and Hargreaves (1995)	Great Britain	34	1 Training hospital	All (years 1–3)	146	58	Smoking beliefs did not change during training, although the rate decreased
Blakey and Seaton (1992)	Scotland	33	1 Nursing school	All (years 1–3)	649	95	A small proportion believed that smoking was *not* very harmful to health
Carmichael and Cockcroft (1990)	Great Britain	43	1 Training hospital	All (years 1–3)	350	95	Smoking was lower among those who replied to the first mailing of the survey

[a] Smoking prevalence rates rounded to the nearest whole number.
[b] Response rates rounded to the nearest whole number.

these potential confounders, the results obtained from complete cross-sectional studies with high response rates are all useful, and tend to suggest that smoking remains a common problem for nursing students worldwide, even though some conflicting results were documented.

Table 2 Single grade or multiple grade studies of tobacco smoking among nursing students

References	Country	Smoking rate (%)[a]	Setting	Grade	Sample size	Response rate (%)[b]	Main findings
CDC (2005)	Albania	42	Nursing schools[c]	3rd year only	271	100	Most thought that health care workers should be trained in smoking cessation techniques
	Bosnia/ Herzegovina	33	Nursing schools[c]	3rd year only	791	100	Less than 30% had received formal training in smoking cessation counselling
	Uganda	1	Nursing schools[c]	3rd year only	378	100	Most thought that health care workers should give advice about smoking cessation
Clark et al. (2004)	Australia	24	1 University	2nd and 3rd years	366	86	Many smokers begin their smoking habit before entering nursing school
Jenkins and Ahijevych (2003)	United States	6	1 University	2nd, 3rd and 4th year	200	47	Tension relief was the main reason for smoking among student nurses
Chalmers et al. (2003)	Canada	13	4 Universities	2nd, 3rd and 4th years	272	62	Nursing students may have confusion about themselves as role models
Patkar et al. (2003)	United States	14	1 University	1st and 2nd year	126	50	Nursing students were more likely to smoke than medical students
Piko (2002)	Hungary	48	1 University	3rd year only	100	90	Nursing students were more likely to smoke than medical students
Andrea et al. (2001)	Italy	51	5 Universities	1st year only	252	92	Smoking beliefs were generic and drawn from unspecific information sources
Ohida et al. (2001a)	Japan	13	17 Public health nursing schools	Single year only[d]	539	91	Smoking was less common among students in public health nursing schools
	Japan	22	16 Midwifery schools	Single year only[d]	325	95	Nurses who had already qualified were less likely to smoke
Gorin (2001)	United States	24	12 Nursing schools	2nd and 3rd years	476	89	Current smokers were less likely to participate in tobacco control activities
Melani et al. (2000)	Italy	43	5 Universities	1st year only	205	88	Nursing students were more likely to smoke than medical students

(continued on next page)

Table 2 (*continued*)

References	Country	Smoking rate (%)[a]	Setting	Grade	Sample size	Response rate (%)[b]	Main findings
Sone (1997)	Japan	18	3 Nursing schools	1st year only	197	100	Nursing students were frequently exposed to cigarette advertising in different formats
Adams et al. (1994)	Australia	65	1 University and 3 teaching hospitals	3rd year only	221	72	Hospital student nurses were unconvinced about the health promotion role of nurses
O'Connor and Harrison (1992)	Canada	24	33 Universities	4th year only	914	80	Having friends who smoked was an important reason for commencing smoking

[a] Smoking prevalence rates rounded to the nearest whole number.
[b] Response rates rounded to the nearest whole number.
[c] The exact number of nursing schools was not listed.
[d] Specialist nursing course of only 1 year duration.

Single grade or multiple grade studies

Surveying one or two grades appears to be the most common method for investigating tobacco smoking among nursing students. A total of 16 such investigations were located during this literature review, with sample sizes ranging from 100 (Piko, 2002) to 914 (O'Connor and Harrison, 1992), and response rates from 47% (Jenkins and Ahijevych, 2003) to 100% (CDC, 2005). Eleven authors surveyed a single grade of student, with five surveying two or three grades. Similar to the complete cross-section surveys summarised in Table 1, the overall prevalence of smoking (as derived from single grade or multiple grade studies) appears to vary widely, depending on country and year of study. Refer to Table 2. In Australia for example, Adams et al. (1994) revealed that two-thirds of their nursing students were smokers (65%), whereas in Uganda (CDC, 2005) the smoking rate was negligible (1%), even though both studies targeted students in the third grade. Excessive smoking rates were also revealed by Melani et al. (2000) and Andrea et al. (2001) who showed that roughly half of their Italian nursing students used tobacco (43% and 51%, respectively). In Japan, Ohida et al. (2001a) demonstrated that smoking rates differed among nurses undertaking advanced study in either midwifery or public health, with public health nursing students having the lower rate (13%).

Many single-grade studies revealed some interesting information with regard to student's personal smoking habits. In Australia, Clark et al. (2004) found that most students had actually begun smoking before entering their nursing school. In Canada however, O'Connor and Harrison (1992) showed that having friends who smoked was an important reason for commencing the habit. Jenkins and Ahijevych (2003) suggested that tension relief was the main reason for smoking. Sone (1997) found that Japanese nursing students were frequently exposed to cigarette advertising in many different formats. Demographics may play an important role, as separate studies conducted in the United States (Patkar et al., 2003), Hungary (Piko, 2002) and Italy (Melani et al., 2000), all revealed that nursing students were more likely to smoke than medical students at the same university. Student nurses may also have some confusion regarding their potential status as role models for appropriate behaviour (Chalmers et al., 2003). In Australia for example, Adams et al. (1994) demonstrated that hospital-based student nurses were unconvinced about the health promotion role of nurses, while in the United States, Gorin (2001) showed that current smokers were less likely to participate in tobacco control activities. This may relate to risk perceptions, as Andrea et al. (2001) revealed that smoking beliefs among Italian students were generic and drawn from unspecific

Table 3 Longitudinal studies of tobacco smoking among nursing students

References	Country	Setting	Grade	Baseline			Duration	Follow Up			Main findings
				Sample size	Response rate (%)[a]	Smoking rate (%)[b]		Sample size	Response rate (%)	Smoking rate (%)[b]	
Clement et al. (2002)	Canada	1 University	1st year only	179	93	12	3 Years	52	27	10	Smoking rate decreased by 2%
Ohida et al. (2001b)	Japan	2 Vocational schools	1st and 2nd years	266	93	21	1 Year	224	84	31	Smoking rate increased by 10%
	Japan	2 Colleges and universities	1st and 2nd years	273	85	9	1 Year	222	81	12	Smoking rate increased by 3%
Shriver and Scott-Stiles (2000)	United States	1 University	2nd year only	71	100	7	2 Years	57	80	9	Smoking rate increased by 2%
Boccoli et al. (1997)	Italy	1 Nursing school	1st year only	536	95	47	2 Years	501	93	54	Smoking rate increased by 7%

[a] Response rates rounded to the nearest whole number.
[b] Smoking prevalence rates rounded to the nearest whole number.

Table 4 Intervention studies which address tobacco smoking among nursing students

Reference	Country	Setting	Grade	Sample size	Smoking rate (%)[a]	Intervention method	Time to follow up	Main outcomes
Sejr and Osler (2002)	Denmark	1 University	1st year only	220	18	8 lectures on the health consequences of smoking	7 Weeks	No change in smoking rates was observed
Rowe and Clark (1999)	Northern Ireland	1 University	All (years 1–3)	65	46	One session of individualized counselling	1 Year	25% of the smokers had quit by follow up
Hope et al. (1998)	Ireland	1 University	All (years 1–3)	169	34	Passive interventions and stress discussion groups	3 Years	No change in smoking rates was observed

[a] Smoking prevalence rates rounded to the nearest whole number.

information sources. Whatever the reason, the large number of single grade and multiple grade studies conducted in the past 15 years, have all revealed some important information on smoking habits among contemporary nursing students.

Longitudinal studies

Although longitudinal studies represent an accurate method for determining the progression of smoking trends over time (particularly causation), very few investigations of this nature appear to have been conducted among nursing students. Researchers may be reluctant to begin such studies due to a potentially high dropout rate among nursing students as they work through their degree, a potentially high attrition rate for the follow up component, as well as other issues relating to ethical concerns and privacy issues when individuals have to be specifically re-contacted over a number of years. Nevertheless, a total of five high-quality longitudinal studies were identified during this review, as shown in Table 3. Results from an additional longitudinal study (not shown in the table) were published by Schwartz and Zeger (1990), who reported that the overall smoking prevalence among their nursing students in Los Angeles was 18%. As the Los Angeles cohort was initially recruited in 1961 (Hammer et al., 1974), it did not meet the inclusion criteria for this review. Nevertheless, some additional information was revealed during the study and is worthy of mention. Firstly, passive smoking was shown to increase the incidence rates of respiratory symptoms among student nurses (Schwartz and Zeger, 1990). Secondly, by the time of their graduation, 39% of the students had become smokers (Hammer et al., 1974).

Ohida et al. (2001b) conducted two high-quality longitudinal studies among students at Japanese nursing universities and vocational nursing schools. Over a two-year period, the prevalence of smoking increased by 10% at the vocational schools and 3% at the universities. The authors achieved high follow-up rates of 84% and 81%, respectively, suggesting that response bias was minimized. A similar increase in smoking was reported in the United States by Shriver and Scott-Stiles (2000), who followed a second-year cohort of university students over two years and found that the prevalence of smoking had increased by 2% during this time. Similar to Ohida et al. (2001b), the American study benefited from a high follow-up rate (80%), although the total number of subjects in the final group was limited (only 57 remained by follow-up). In Italy, Boccoli et al. (1997) followed over 500 first-year students for two years and found that their smoking prevalence also increased by 7%. From a response rate of 93%, these Italian authors showed that over half (54%) of their university-based nursing students were smoking by the end of the course (Boccoli et al., 1997).

Whether the results from these studies can be generalized internationally is not known however, as some contradictory evidence was revealed in Canada. In a longitudinal study of health behaviours (not only smoking), Clement et al. (2002), followed a first-year cohort of university students over three years and found that their smoking rate actually decreased by 2%, falling from 12% to 10%. Whether this represents a true decrease is not known however, as the final follow-up group consisted of only 52 students from the original 193, a follow-up rate of 27%. The importance of non-responder bias, that is smokers who refused to be followed up, suggests that the longitudinal results from this particular study should be treated with caution. Nevertheless, the finding that between 10% and 12% of Clement et al.'s (2002) Canadian nursing students smoke tobacco and that the percentage of non-smokers was significantly higher than for the general Canadian population (p. 262), adds greatly to the overall body of knowledge on this topic.

Intervention studies to reduce smoking

The prevention of tobacco smoking and the promotion of smoking cessation activities is an important goal in nursing. Despite this realisation and the fact many students continue to smoke, very few researchers have undertaken intervention studies among nursing students. Only three such manuscripts appear to have been published in English over the past 15 years, two from Ireland and one from Denmark. Refer to Table 4. Unfortunately, it also appears that the overall benefits of tobacco smoking interventions are limited among university-based nursing students. In Denmark for example, Sejr and Osler (2002) recruited 220 students (of whom 18% were current smokers) and administered eight lectures on the health consequences of smoking. The authors utilised a controlled study design, where participants were randomly allocated into either the intervention or control group. By the follow-up period seven weeks later however, no change in smoking rates was observed.

Rowe and Clark (1999) conducted a one-year smoking intervention among a small group of

nursing students in Northern Ireland. The intervention consisted of individualized counselling based on the specific needs of each student. By the follow-up period one year later, 25% of smokers had quit. The relative value of this intervention should be treated with caution however, as participants were initially required to have 'expressed a desire to give up smoking'. Furthermore, participants were assigned to either the intervention program or comparison group 'based on their preferences' (p. 303). This suggests that students who did not wish to give up smoking were not included in the study, while students who preferred interventions were subsequently assigned to the intervention group. It is possible therefore, that the 25% reduction in smoking rates observed at follow-up may reflect a 25% effectiveness rate among students who already wanted to quit smoking. This is not to say that smoking interventions are not effective or should not be attempted, rather it is the overall subgroup of smokers among nursing students who should be targeted for aggressive intervention. In another study from Ireland, Hope et al. (1998) conducted a series of passive interventions and stress discussion groups for 169 nursing students, among whom 34% were current smokers. By the follow-up period three years later, no significant change in smoking prevalence was observed, although there was an increase in the number of students who participated in regular exercise (another variable investigated during the study).

Although the results from these intervention studies appears to be a little disappointing, the value of antismoking interventions for nursing students should not be underestimated. Preventing nursing students from commencing smoking and helping those who already smoke to give up their habit represents a critical issue in nursing education. Although the intervention studies identified during this review did not appear to have achieved their goal in its entirety, all studies offered useful evidence as to how it might be accomplished in future. Sejr and Osler (2002) for example, found that nursing student's attitudes towards smoking and their intended preventive behaviour may be influenced by their own smoking behaviour, and that nursing students who smoke were less likely to give anti smoking advice. Rowe and Clark (1999) emphasized the importance of helping nurses to identify coping strategies and support systems which might help them quit smoking. The authors suggested that action is required at a number of levels, particularly the introduction of a clear non-smoking policy in all colleges of nursing. Rowe and Clark (1999) also advised that health promotion coordinators and peer support groups may be useful. Hope et al. (1998) further suggested that health promotion skills should be integrated into nurse education. Despite the absence of a clearly effective intervention, all of these strategies may be useful in helping to reduce the seemingly high rate of smoking among student nurses around the world.

Conclusion

Overall, this review has shown that although tobacco usage is fairly common among nursing students, its prevalence and distribution varies depending on the country of study and time period when the study was undertaken. Although there is some evidence to suggest that smoking rates increase by year of study in the nursing course, not all research has shown a clear association in this regard. Similarly, the value of anti smoking interventions for nursing students appears to be of limited value. Given these issues, further research which helps to ascertain why student nurses do not wish to give up their habit is clearly needed both locally and internationally. The development of an internationally standardized definition for tobacco smoking among this demographic may also be useful to help standardize future studies on tobacco smoking.

References

Adams, A., Bell, P.F., Pelletier, S.D., 1994. Nurses and smoking: A comparative study of students of nursing and teaching. Australian Health Review 17, 84–101.

Adriaanse, H., Van Reek, J., Zandbelt, L., Evers, G., 1991. Nurses' smoking worldwide. A review of 73 surveys on nurses' tobacco consumption in 21 countries in the period 1959–1988. International Journal of Nursing Studies 28, 361–375.

Ahmadi, J., Maharlooy, N., Alishahi, M., 2004. Substance abuse: Prevalence in a sample of nursing students. Journal of Clinical Nursing 13, 60–64.

Andrea, M.S., Walter, V., Elena, B., Alfea, F., Piersante, S., 2001. A comparison of smoking habits, beliefs and attitudes among Tuscan student nurses in 1992 and 1999. European Journal of Epidemiology 17, 417–421.

Baron-Epel, O., Josephsohn, K., Ehrenfeld, M., 2004. Nursing students' perceptions of smoking prevention. Nurse Education Today 24, 145–151.

Blakey, R., Seaton, A., 1992. Smoking attitudes amongst nursing tutors and their students. Health Bulletin (Edinburgh) 50, 417–421.

Boccoli, E., Federici, A., Melani, A.S., De Paola, E., 1996. Results of a questionnaire about nurse students' smoking habits and knowledges in an Italian teaching school of nursing. European Journal of Epidemiology 12, 1–3.

Boccoli, E., Federici, A., Trianni, G.L., Melani, A.S., 1997. Changes of smoking habits and beliefs during nurse training: A longitudinal study. European Journal of Epidemiology 13, 899–902.

Carmichael, A., Cockcroft, A., 1990. Survey of student nurses' smoking habits in a London teaching hospital. Respiratory Medicine 84, 277–282.

Centers for Disease Control and Prevention (CDC), 2005. Tobacco use and cessation counselling – Global health professionals survey pilot study, 10 countries, 2005. Morbidity and Mortality Weekly Report 54, pp. 505–509.

Chalmers, K., Seguire, M., Brown, J., 2003. Health promotion and tobacco control: Student nurses' perspectives. Journal of Nursing Education 42, 106–112.

Charlton, A., While, D., Mochizuki, Y., 1997. A survey into the smoking habits of nursing students. Nursing Times 93, 58–60.

Clark, E., McCann, T.V., Rowe, K., Lazenbatt, A., 2004. Cognitive dissonance and undergraduate nursing students' knowledge of, and attitudes about, smoking. Journal of Advanced Nursing 46, 586–594.

Clement, M., Jankowski, L.W., Bouchard, L., Perreault, M., Lepage, Y., 2002. Health behaviors of nursing students: A longitudinal study. Journal of Nursing Education 41, 257–265.

Gorin, S.S., 2001. Predictors of tobacco control among nursing students. Patient Education and Counselling 44, 251–262.

Hammer, D.I., Hasselblad, V., Portnoy, B., Wehrle, P.F., 1974. Los Angeles student nurse study. Daily symptom reporting and photochemical oxidants. Archives of Environmental Health 28, 255–260.

Hope, A., Kelleher, C.C., O'Connor, M., 1998. Lifestyle practices and the health promoting environment of hospital nurses. Journal of Advanced Nursing 28, 438–447.

Jenkins, K., Ahijevych, K., 2003. Nursing students' beliefs about smoking, their own smoking behaviors, and use of professional tobacco treatment intervention. Applied Nursing Research 16, 164–172.

Krommydas, G., Kotrotsiou, E., Raftopoulos, V., Paralikas, T., Gourgoulianis, K.I., Molyvdas, P.A., 2004. Smoking in health science students with asthma. Canadian Respiratory Journal 11, 476.

Melani, A.S., Verponziani, W., Boccoli, E., Trianni, G.L., Federici, A., Amerini, R., Vichi, M.G., Sestini, P., 2000. Tobacco smoking habits, attitudes and beliefs among nurse and medical students in Tuscany. European Journal of Epidemiology 16, 607–611.

Melby, C.S., 2005. Examining the future of professional journals. Nursing and Health Sciences 7, 219–220.

Najem, G.R., Passannante, M.R., Foster, J.D., 1995. Health risk factors and health promoting behavior of medical, dental and nursing students. Journal of Clinical Epidemiology 48, 841–849.

O'Connor, A.M., Harrison, M., 1992. Survey of smoking prevalence among Canadian nursing students and registered nurses. Canadian Journal of Public Health 83, 417–421.

Ohida, T., Sakurai, A., Kamal, A., Sone, T., Takemura, S., Fukushima, T., 2001a. Smoking among Japanese nursing students: A nationwide survey. Tobacco Control 10, 397.

Ohida, T., Kamal, A.A., Takemura, S., Sone, T., Minowa, M., Nozaki, S., 2001b. Smoking behavior and related factors among Japanese nursing students: A cohort study. Preventive Medicine 32, 341–347.

Patkar, A.A., Hill, K., Batra, V., Vergare, M.J., Leone, F.T., 2003. A comparison of smoking habits among medical and nursing students. Chest 124, 1415–1420.

Piko, B.F., 2002. Does knowledge count? Attitudes toward smoking among medical, nursing, and pharmacy students in Hungary. Journal of Community Health 27, 269–276.

Rahman, M., Fukui, T., 2003. Biomedical publication – Global profile and trend. Public Health 117, 274–280.

Rowe, K., Clark, J.M., 1999. Evaluating the effectiveness of a smoking cessation intervention designed for nurses. International Journal of Nursing Studies 36, 301–311.

Schwartz, J., Zeger, S., 1990. Passive smoking, air pollution, and acute respiratory symptoms in a diary study of student nurses. American Review of Respiratory Disease 141, 62–67.

Sejr, H.S., Osler, M., 2002. Do smoking and health education influence student nurses' knowledge, attitudes, and professional behavior? Preventive Medicine 34, 260–265.

Sekijima, K., Seki, N., Suzuki, H., 2005. Smoking prevalence and attitudes toward tobacco among student and staff nurses in Niigata, Japan. Tohoku Journal of Experimental Medicine 206, 187–194.

Shriver, C.B., Scott-Stiles, A., 2000. Health habits of nursing versus non-nursing students: A longitudinal study. Journal of Nursing Education 39, 308–314.

Sone, T., 1997. Frequency of contact with cigarette advertising and smoking experience among young women in Japan. Journal of Epidemiology 7, 43–47.

Suzuki, K., Ohida, T., Yokoyama, E., Kaneita, Y., Takemura, S., 2005. Smoking among Japanese nursing students: Nationwide survey. Journal of Advanced Nursing 49, 268–275.

West, R., Hargreaves, M., 1995. Factors associated with smoking in student nurses. Psychology and Health 10, 195–204.

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Original Article

Tobacco smoking habits among a cross-section of rural physicians in China

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Abstract

Objective: *To investigate the prevalence and distribution of tobacco smoking among rural Chinese physicians.*

Design: *A self-reporting survey adapted from previous international studies.*

Setting: *A teaching hospital in Hebei Province, China.*

Subjects: *A complete cross-section of 361 physicians working in all hospital departments.*

Results: *The overall response rate was 79.2%, among whom 15.7% (95% confidence interval (CI) 12.0–20.4) were current smokers and 1.0% ex-smokers (95% CI 0.4–3.1). There were no female smokers when stratified by sex, although the prevalence rate among male physicians was 31.9% (95% CI 24.8–40.0). The prevalence of smoking varied widely by hospital department, ranging from zero in the obstetrics and gynaecology department, to 32.6% in the surgical unit. Smoking rates also varied by age, with physicians younger than 25 years having the lowest prevalence (6.3%). Although they only accounted for 7.1% of the entire group by number, the highest smoking prevalence was seen among physicians aged 50–54 years (31.6%).*

Conclusions: *Although our study suggests that smoking is an important health issue for rural Chinese physicians, the distribution of risk is not uniform. Future preventive measures will, therefore, need to consider the individual situation of physicians who smoke, particularly those in the older age groups.*

KEY WORDS: *China, physician, rural, smoking, tobacco.*

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Original Contribution

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Tobacco Smoking Prevalence among a Cross-section of Dentists in Queensland, Australia

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Summary: The purpose of this study was to investigate the epidemiology of tobacco smoking among dentists in Queensland, Australia. We utilized an anonymous, self-reporting questionnaire which was posted to 400 dentists during 2004. The overall response rate was 72.1%, among whom the prevalence of current smoking was estimated to be 3.9% (95%CI: 2.2-6.9), with a further 11.0% being ex-smokers (95%CI: 7.9-15.2). Smoking rates varied by age, with 6.1% of dentists aged younger than 30 years who were smokers. The lowest smoking prevalence was seen among dentists aged between 30 and 40 years (1.4%), and the highest among those aged over 60 years (7.1%). Regarding weekly work hours, the highest smoking prevalence was seen among dentists who worked between 25 and 35 hrs per week (6.8%). Ex-smokers were more likely to work less than 25 hrs per week (21.7%). Smoking rates also varied by career length, with the lowest prevalence among dentists who had worked 10 to 20 years (1.3%) and the highest rate among those who had worked over 40 years (6.7%). A similar trend was revealed for ex-smokers, with prevalence rates of 1.7% and 33.3%, respectively. Overall, our study suggests that the prevalence of smoking is rather low among Queensland dentists. As the distribution of smoking was not uniform however, future preventive measures will need to consider the individual situation of dentists who smoke, particularly those in the older age groups.

Key words Australia, dentist, smoking, prevalence, tobacco

INTRODUCTION

Tobacco smoking represents the single biggest preventable cause of death in the world today. It claims around 5 million lives per year, a figure that expected to rise to 10 million by the year 2020 [World Health Organization Website. Available online at: http://www.wpro.who.int/media_centre/press_releases/pr_20050830.htm]. Roughly 20% of Australians currently smoke, although the prevalence among women has been declining in recent years. According to the World Health Organization, Australian physicians also have one of the world's lowest smoking rates, approximately 2% among females and 4% among males [World Health Organization Website. Available online at: http://www.who.int/tobacco/en/atlas5.pdf]. The prevalence among Australian dentists is however, unknown. This is unfortunate, as dentists hold an important position as community role models with regard to appropriate health behaviors. Helping their patients to quit smoking is an important example, as there is evidence linking the relationship between a dentist's own smoking habits and their desire to help patients quit smoking. As fewer dentists smoke, an increasing proportion will be inclined to promote nonsmoking [1]. Smoking is also a significant cause of many oral diseases that dentists will regularly encounter during their prac-

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Abbreviation: 95%CI; 95% Confidence Intervals.

tice, such as halitosis, gingivitis and oral cancers. Reducing community smoking levels therefore has the added bonus of reducing overall dental morbidity.

Despite this fact, dentists and doctors have not always had a positive history with regard to appropriate health behaviors, such as tobacco smoking. In the early 1950s for example, around half of all physicians smoked [2]. A survey conducted in 1967 revealed that around one-third of American dentists were smokers, a figure which had fallen to 23% by 1975 [2,3]. By the 1980s further progress had been made in reducing tobacco consumption, with the prevalence of smoking among American dentists falling to 8% [4]. Even more encouragingly, a study from Thailand conducted in 2001 found that less than 3% of dentists smoked [5]. Surprisingly, the prevalence of smoking among dentists in general and Australian dentists in particular, has not been well studied. Although the World Health Organization suggests that between 3% and 61% of male physicians smoke tobacco [World Health Organization Website. Available online at: http://www.who.int/tobacco/en/atlas5.pdf], no figures are provided for dentists. Furthermore, few, if any researchers have investigated smoking among a cross-section of Australian dentists. Given these inconsistencies, we considered it necessary to investigate the epidemiology of tobacco smoking among a cross-section of dentists in Queensland, Australia.

MATERIALS AND METHODS

This study utilized a self-reporting postal questionnaire which was administered to a complete cross-section of dentists in Queensland, Australia. Ethical approval was obtained from the James Cook University Human Ethics Sub-Committee in 2003. Our questionnaire was adapted from other investigations of tobacco smoking conducted among dentists and doctors in various countries [1-17]. It consisted of a simple tick-box format, with questions focusing on current status and previous history of tobacco smoking, as well as basic demographic items such as age, weekly working hours and career length. We then obtained a random sample of 400 members registered with the Queensland Branch of the Australian Dental Association (ADA) from which a series of postal labels with random identification numbers were generated in 2004. Each dentist was sent a cover sheet explaining the purpose of the survey and how to complete the form, a blank questionnaire (which included the ID number) and a postage-paid return envelope. The questionnaire itself was anonymous, and the participants were asked not to include their name or any other form of identification. Our study was preempted by a notice in the ADA Queensland Branch Newsletter advising dentists about the pending survey. There were no penalties or rewards for participation and informed consent was implied if the anonymous questionnaires were completed and returned. As each questionnaire was returned, the ID number was noted. ID numbers which were not returned were then forwarded to the dental association. From this list, one reminder was sent to dentists who had not returned their questionnaires after the initial mailing. Data was entered into a spreadsheet program and analyzed by statistical software. Basic statistics were calculated, with smoking prevalence rates calculated by gender, and stratified by age range, weekly working hours and career length. Computed 95% Confidence Intervals (95%CI) were calculated for smoking prevalence rates, with mean values displayed for age, weekly working hours and career length.

RESULTS

We obtained completed questionnaires from 281 of 400 registered dentists, with 10 questionnaires undeliverable and marked 'return-to-sender'. The overall response rate was therefore: 281/390 = 72.1%. Of the respondents, 73% were male and 27% female, with an average age of 45 years. They worked an average of 36 hrs per week, with and overall career duration of 21 years. As shown in

TABLE 1.
Smoking prevalence among dentists

	%	(95% CI) [a]
All Dentists		
Never Smoked	85.1	(80.4−88.7)
Current Smoker	3.9	(2.2− 6.9)
Previous Smoker	11.0	(7.9−15.2)
Males Only		
Never Smoked	80.1	(74.1−85.0)
Current Smoker	4.9	(2.7− 8.7)
Previous Smoker	15.0	(10.8−20.6)
Mean Values		
Dentists' Age	45.0 Years	
Weekly Work	36.0 Hours	
Career Length	21.0 Years	

[a]: Computed 95% Confidence Intervals for prevalence rates

TABLE 2.
Smoking prevalence among dentists by age range

Smoking Status	<30Yrs		30-40 Yrs		40-50 Yrs		50-60 Yrs		>60 Yrs	
	n	(%) [a]	n	(%) [a]	n	(%) [a]	n	(%) [a]	n	(%) [a]
Current Smoker	2	(6.1)	1	(1.4)	3	(3.5)	3	(5.1)	2	(7.1)
Ex-Smoker	0	(0.0)	4	(5.6)	12	(13.8)	5	(8.5)	10	(35.7)
Proportion [b]	33	(11.8)	72	(25.8)	87	(31.2)	59	(21.2)	28	(10.0)

[a] : Prevalence of smoking or ex-smoking in each subgroup
[b] : Proportion of all dentists in each subgroup

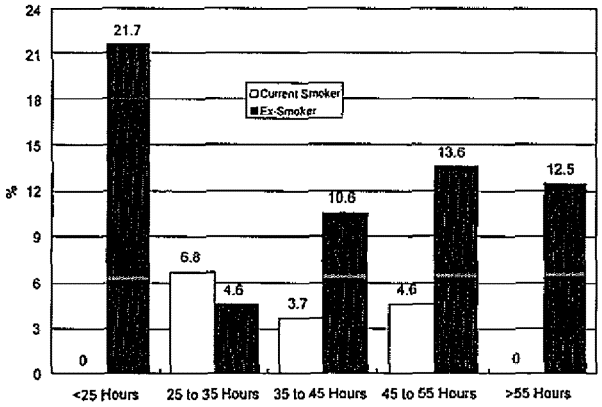

Fig. 1. Smoking prevalence among dentists by weekly working hours.

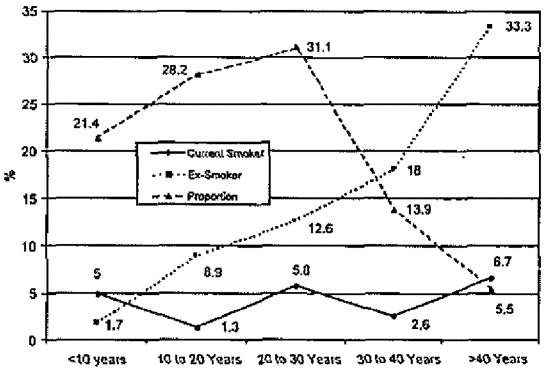

Fig. 2. Smoking prevalence among dentists by career length.

TABLE 3.
Smoking rates among dentists and doctors

	Rate [a]	Year	Ref. [b]
Dentists			
United States	23%	1988	[7]
Ireland	14%	1993	[20]
Finland	6-25%	1991	[21]
Norway	7%	2004	[22]
Australia	6%	1994	[17]
Thailand	2%	2001	[5]
Doctors			
Netherlands	38%	1993	[8]
France	32%	1993	[9]
Italy	31%	1998	[10]
China	16%	2005	[11]
United Kingdom	5%	1993	[13]
New Zealand	5%	1998	[12]
Australia	4%	2005	[c]

[a]: Prevalence rates rounded to the nearest whole number
[b]: Reference number as listed in this manuscript
[c]: The current study

Table 1, the prevalence of current smoking was 3.9% (95%CI: 2.2-6.9), with a further 11.0% being ex-smokers (95%CI: 7.9-15.2). There was only 1 female smoker when stratified by gender, thereby increasing the prevalence rate among males to 4.9% (95%CI: 2.7-8.7). As shown in Table 2, smoking rates varied by age, with 6.1% of dentists aged younger than 30 years who were smokers. The lowest smoking prevalence was seen among dentists aged between 30 and 40 years (1.4%), and the highest among those aged over 60 years (7.1%). Figure 1 shows the prevalence of smoking with regard to weekly work hours. The highest smoking prevalence was seen among dentists who worked between 25 and 35 hrs per week (6.8%). Ex-smokers were more likely to work less than 25 hrs per week (21.7%). The dentist's average age varied with respect to hours worked per week, with the average age of dentists working less than 25 hrs per week being 51 years. Conversely, the average of dentists working over 55 hrs per week was 41 years. Smoking rates varied by career length, with the lowest prevalence among dentists who had worked 10 to 20 years (1.3%) and the highest rate among those who had worked over 40 years (6.7%). A similar

pattern was revealed for ex-smokers in Fig. 2, with prevalence rates of 1.7% and 33.3%, respectively. A comparison between smoking rates among the dentists in this study, and the results from other international researchers are displayed in Table 3.

DISCUSSION

The overall smoking prevalence among Queensland dentists was around 4%, which is considerably lower than previous studies conducted in the United States 8% [4] to 23% [7]. It was also lower than that reported in an earlier study of Victorian dentists (6%) [17], but higher than an investigation from Thailand (2%) [5]. The confidence interval for our prevalence rate however, ranged from around 2% to 7%, which is similar to the result obtained during other studies of dentists mentioned above [4,5,17]. Nevertheless, as few other researchers have documented smoking among dentists generally, there is limited data with which to compare our results. One reasonably comparable group is medical doctors, who might be expected to share similar demographic characteristics with their dental colleagues. The prevalence of smoking among physicians seems to vary widely depending on country of origin, with rates ranging from 5% in the United Kingdom [13] and New Zealand [12] to 38% in the Netherlands [8]. When stratified by gender, we found that there was only one female smoker, which is similar to some investigations of doctors in Malaysia [14] and Hong Kong [15], and also a study of Thai dentists [5], where no females smoked at all. Roughly 5% of male dentists in Queensland were smokers, which is lower than that reported by doctors in an American study (10%) [16], but similar to an investigation from Hong Kong (7%) [15].

When compared to population data from the World Health Organization [World Health Organization Website, Available online at: http://www.who.int/tobacco/media/en/Australia.pdf], it appears that Queensland dentists smoke tobacco at about one-fifth of the community rate among Australians (20%) This finding is important, as it suggests that dentists can take an active role in helping their patients to quit smoking, a practice that is encouraged for Australian dentists [18]. Nevertheless, it is interesting to consider why smoking rates among dentists and doctors differ from that of the community in which they live. Previous research has suggested that physicians at least, tend to give up smoking before the general population for a few reasons. Doctors probably understand the negative medical consequences more quickly, their devotion to health conflicts naturally with unhealthy behaviors, and finally, because smoking usually incurs a negative image in health care long before it does so in the community [19]. Given their major similarities with physicians, it is reasonable to assume that dentists would also be affected in a similar manner.

The highest rates of smoking and ex-smokers were reported among the older dentists, which is similar to previous research conducted among physicians in France [9] and the Netherlands [8]. Another investigation of American physicians also revealed higher smoking rates occurred among those aged between 50 and 69 years of age [16]. There were few smokers aged younger than 30 years, which is similar to a previous study of physicians' smoking in New Zealand [12]. It seems therefore, that there is a tendency for smoking rates to decrease over time among medical personnel due to a generational effect, as the social climate of a country changes and more people give up smoking [8,9,11]. This phenomena is also reflected in the higher rates of smokers and ex-smokers who had been practicing dentistry for over 30 years. Older dentists will tend to have worked for longer, and thus, their smoking rates should be higher when compared to their less experienced and younger colleagues. The relationship between smoking rates and weekly working hours during our study was novel, with the highest proportion of ex-smokers working less than 25 hrs per week. This may reflect older dentists with a higher proportion of ex-smokers, being the most likely to be semi-retired and working shorter hours. The finding that average age was higher among dentists working less than 25 hrs per week seems to support such a hypothesis. On the other hand it may simply be a statistical artifact which will need to be clarified in future, large scale studies of Australian dentists.

Although this study benefited from an encouragingly high response rate, there may have been a selection bias where current smokers were unwilling to return their questionnaire. With a response rate of 72%, there were presumably 109 dentists who did not return the questionnaire. If all of them were smokers (a highly unlikely scenario) the maximum smoking rate would have been much higher, around 31%. On the other hand, if there were no smokers among the non-respondents, the prevalence rate would be closer to 3%. Although we could not determine exactly why the non-responders did not respond, we are confident that smoking habits them-

selves were probably not the reason. With this in mind, we were careful to use many strategies which have previously been shown to improve response rates and obtain a more representative sample during postal surveys [23]. These strategies included the use of a short questionnaire, the use of an anonymous questionnaire, one which covered a topic of interest to the participants and the fact that our study clearly originated from a university rather than a commercial enterprise. As such, we anticipate that the sample was representative of Queensland dentists generally, and that a high proportion of smokers should not have been concentrated in the non-respondents group. Nevertheless, future longitudinal research should now be conducted among dentists in Queensland as elsewhere, to help clarify some of the emerging issues uncovered during our study.

CONCLUSION

Overall, this investigation suggests that the prevalence of smoking is probably quite low among Queensland dentists. Although smoking remains an important health issue among them, the distribution of smoking does not appear to be uniform, with a high proportion of smokers being concentrated in the older age groups. As such, future preventive measures will need to consider the individual situation of dentists who smoke, particularly those who are older and less likely to quit their habit.

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REFERENCES

1. O'Shea RM, and Corah NL. The dentist's role in cessation of cigarette smoking. Public Health Rep 1984; 99:510-514.
2. Garfinkel L, and Stellman SD. Cigarette smoking among physicians, dentists and nurses. CA Cancer J Clin 1986; 36:2-8.
3. Noll CE. Health Professionals and the Problems of Smoking and Health. Report No. 2: Dentists' behavior, beliefs and attitudes toward smoking and health. Report on the NORC Survey 4001. Chicago, University of Chicago, National Opinion Research Centre, 1969.
4. Christen AG. Survey of smoking behavior and attitudes of 630 American dentists: Current trends. J Am Dent Assoc 1984; 109:271-272.
5. Leggat PA, Chowanadisai S, Kedjarune U, Kukiattrakoon B, and Yapong B. Health of dentists in southern Thailand. Int Dent J 2001; 51:348-352.
6. Garfinkel L. Cigarette smoking among physicians and other health professionals, 1959-1972. CA Cancer J Clin 1976; 26:373-375.
7. Stellman SD, Boffetta P, and Garfinkel L. Smoking habits of 800,000 American men and women in relation to their occupations. Am J Ind Med 1988;13:43-58.
8. Dekker HM, Looman CWN, Adriaanse HP, and Van Der Maas PJ. Prevalence of smoking in physicians and medical students, and the generation effect in the Netherlands. Soc Sci Med 1993; 36:817-822.
9. Tessier JF, René L, Nejjari C, Belougne D, Moulin J et al. Attitudes and opinions of French general practitioners towards tobacco. Tob Control 1993; 2:226-230.
10. Zanetti F, Gambi A, Bergamaschi A, Gentilini F, De Luca G et al. Smoking habits, exposure to passive smoking and attitudes to a non-smoking policy among hospital staff. Public Health 1998; 112:57-62.
11. Smith DR, Wei N, Zhang YJ, and Wang RS. Tobacco smoking habits among a cross-section of rural physicians in Mainland China. Aust J Rural Health 2006; 14 (in press)
12. Hay DR. Cigarette smoking by New Zealand doctors and nurses: Results from the 1996 population census. NZ Med J 1998; 111:102-104.
13. Hussain SF, Tjeder-Burton S, Campbell IA, and Davies PDO. Attitudes to smoking and smoking habits among hospital staff. Thorax 1993; 48:174-175.
14. Yaacob I, and Abdullah ZA. Smoking habits and attitudes among doctors in a Malaysian hospital. Southeast Asian J Trop Med Public Health 1993; 24:28-31.
15. Cheng KK, and Lam TH. Smoking among young doctors in Hong Kong: A message to medical educators. Med Educ 1990; 24:158-163.
16. Hensrud DD, and Sprafka JM. The smoking habits of Minnesota physicians. Am J Pub Health 1993; 83:415-417.
17. Mullins R. Attitudes and smoking habits of dentists in Victoria: 16 years on. Aust Dent J 1994; 39:324-326.
18. Trotter L, and Worcester P. Training for dentists in smoking cessation intervention. Aust Dent J 2003; 48:183-189.
19. Davis RM. When doctors smoke. Tob Control 1993; 2:187-188.
20. McCartan BE, Sadlier D, and O'Mullane DM. Smoking habits and attitudes of Irish dentists and dental students. J Ir Dent Assoc 1993; 39:26-29.
21. Telivuo M, Vehkalahti M, Lahtinen A, and Murtomaa H. Finnish dentists as tobacco counselors. Community Dent Oral Epidemiol 1991; 19:221-224.
22. Lund M, Lund KE, and Rise J. Preventing tobacco use in Norwegian dental practice. Community Dent Oral Epidemiol 2004; 32:385-394.
23. Edwards P, Roberts I, Clarke M, DiGuiseppi C, Pratap S et al. Increasing response rates to postal questionnaires: Systematic review. Br Med J 2002; 324:1183-1185.

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Contemporary smoking habits among nurses in Mainland China

ABSTRACT

Although China is the world's largest consumer of tobacco and tobacco-related products, the epidemiology of smoking has not been well studied among nurses. Given this serious gap in the literature, we considered it necessary to investigate tobacco smoking habits among a large cross-section of contemporary Chinese nurses, by means of a questionnaire survey. A total of 509 replies were obtained from 520 nurses (response rate: 97.9%). The overall prevalence of smoking was 2.6% (95%CI 1.5 – 4.3). When stratified by gender, the prevalence rate among male nurses was 52.2% (33.0 – 70.8). Of those who smoked, the median number was 11 smokes per day for a period of 25.0 years. When categorized by severity, 15.4% were light smokers, 69.2% moderate smokers and 15.4% heavy smokers. When stratified by age there were no smokers under 25 years, with the prevalence between 25 and 34 years similarly low, at 1.1%. The highest smoking rate was seen among nurses aged 45 to 50 years (10.1%), even though they only comprised 9.8% of the total workforce. Although our study suggests that tobacco usage is relatively uncommon among Chinese nurses overall, the rate among male nurses was alarmingly high. The distribution of smoking by age was not uniform however, with a high proportion being concentrated in the older age ranges. As such, future preventive measures will need to consider the individual situation of Chinese nurses who smoke, particularly those who occupy the older age groups.

KEY WORDS

China; nurse; smoking; tobacco; epidemiology; age; gender

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Tobacco smoking habits among Chinese medical students and their need for health promotion initiatives

Derek R. Smith, Ning Wei and Rui-Sheng Wang

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Research Article

Tobacco smoking habits among a complete cross-section of Australian nursing students

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Abstract This study was undertaken as a complete cross-sectional survey of tobacco smoking habits among 270 undergraduate students at an Australian nursing school (response rate: 84.6%). An anonymous, self-reporting questionnaire survey was used to gather the data. The overall prevalence of current smoking was 15.9%, with a further 8.5% being ex-smokers. The nursing students consumed an average of 11.5 cigarettes per day, they began smoking at 20.8 years of age, and had an average smoking duration of 7.2 years. The students who had previously worked as a nurse were twice as likely to be current smokers. This study suggests that although tobacco smoking remains fairly common among Australian nursing students, its prevalence and distribution vary according to the individual demographics of the group under study. Future researchers will need to consider the changing demographic base from which the new generation of nursing students are drawn.

Key words cross-sectional, nurse, nursing student, smoking, tobacco.

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